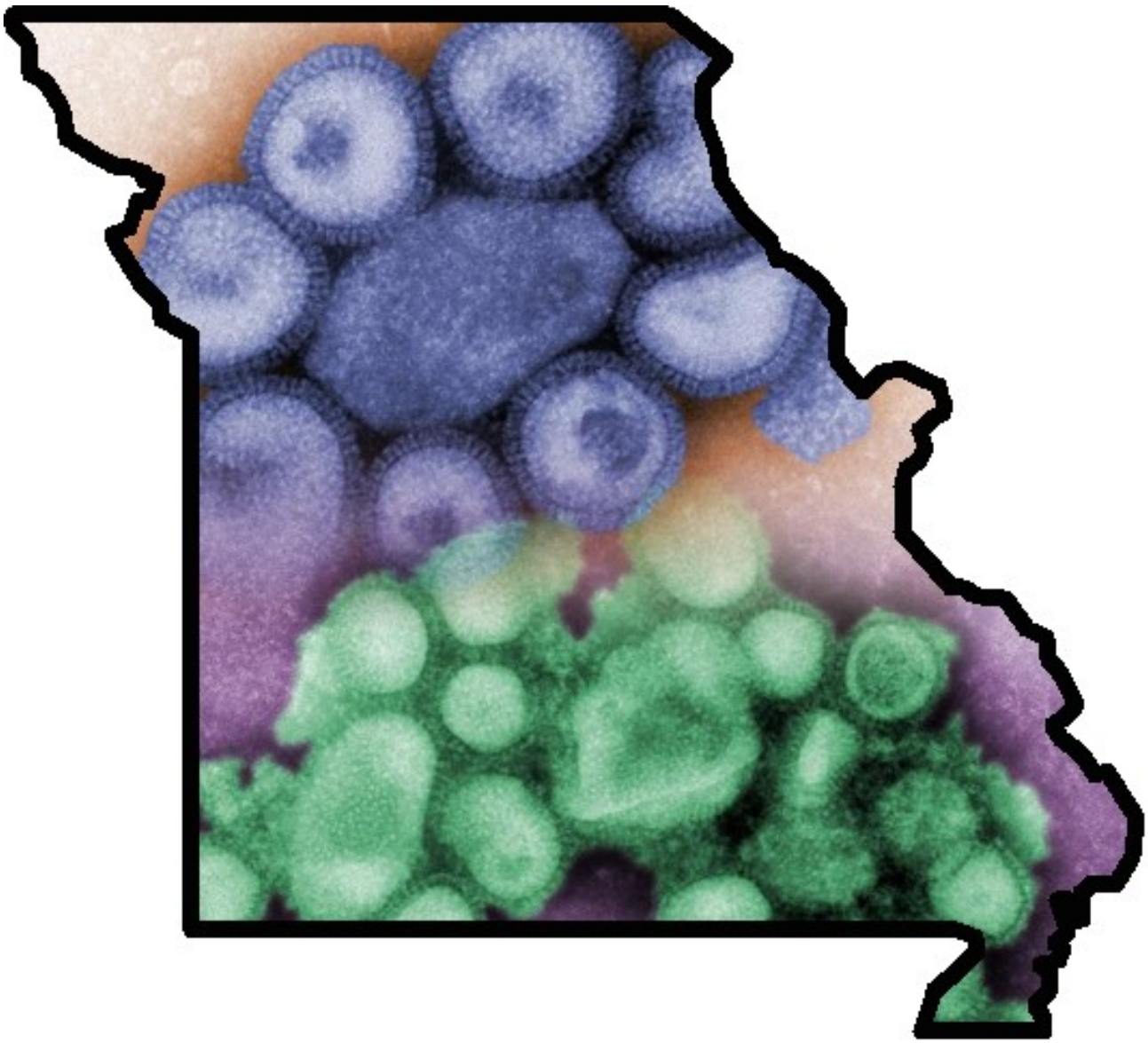
2009 Annual Report

Bureau of Communicable Disease Control and Prevention



Jeremiah W. (Jay) Nixon, Governor
Margaret T. Donnelly, Director
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Acknowledgements

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Communicable Disease Surveillance 2009 Annual Report

Note: This report does **not** include a summary of sexually transmitted diseases, hepatitis (except hepatitis A), HIV, or environmental conditions.

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We thank our reviewers, Kristi Campbell, Section Administrator, and Jacqueline Lapine, Public Information Administrator, for their thorough review and helpful comments.

We would like to acknowledge the contribution of CDC's informative and knowledgeable public health web sites.

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Missouri Profile 2009

Population (2008)*	5,911,605	Percent of Total Population
Urban	69.4%	(Based on 2000 census)
Rural	30.6%	(Based on 2000 census)

Live Births	78,849
Deaths	54,064

Sex	Population	
Male	2,887,907	48.9%
Female	3,023,698	51.1%

Race	Population	Percent of Total Population
White	5,074,011	85.8%
Black	702,990	11.9%
Other	134,604	2.3%

Age Group	Population	
<1	80,944	1.4%
1-4	318,506	5.4%
5-14	770,586	13.0%
15-24	811,896	13.7%
25-39	1,167,254	19.7%
40-64	1,957,184	33.1%
65+	805,235	13.6%

District	Population	
Central	649,521	11.0%
Eastern	2,240,865	37.9%
Northwest	1,542,471	26.1%
Southeast	461,890	7.8%
Southwest	1,016,858	17.2%

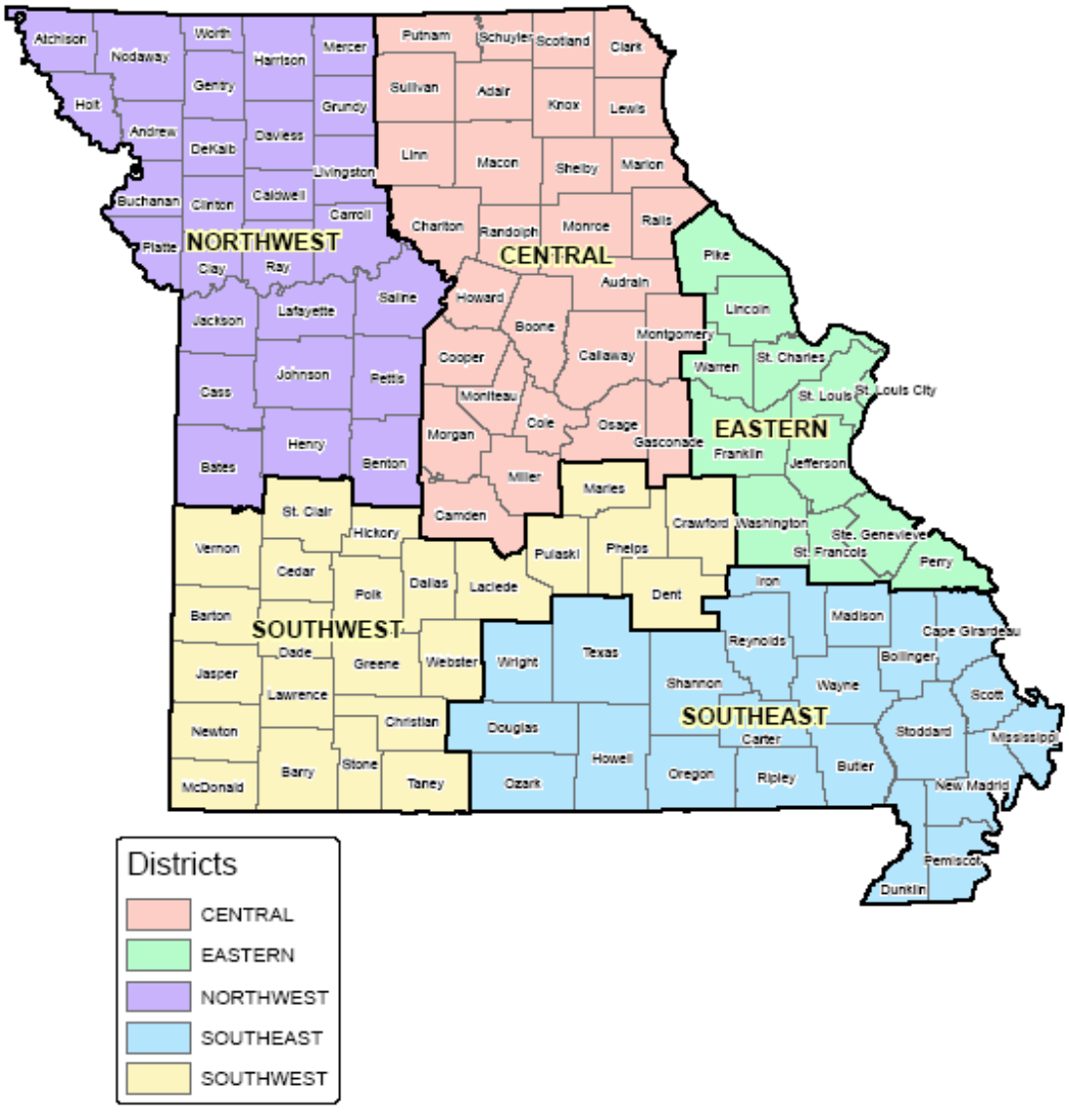
Leading Causes of Death**:	Number of Deaths Reported	Percent of Total Deaths Reported
Heart disease	13,845	25.6%
Malignant Neoplasms	12,435	23.0%
Chronic lower respiratory disease	3,436	6.4%
Cerebrovascular disease (stroke)	3,013	5.6%
Unintentional injuries	2,868	5.3%
Alzeheimer's disease	1,719	3.2%
Pneumonia and Influenza	1,346	2.5%
Diabetes Mellitus	1,326	2.5%

Missouri is 69,697 square miles with slightly more than half of the population living in the two major cities, St. Louis and Kansas City, and their surrounding counties. Jefferson City is the capital. The state has 114 counties. The major flows of traffic within the state are from the east to west along the Missouri valley and southward along the Mississippi.

Although agriculture has remained important as an income-producing activity, services, manufacturing, and wholesale and retail trade have forged ahead since World War II. Manufacturing is led by the production of aerospace and transportation equipment, followed by the processing of food and the production of chemicals. Recreation and tourism have surpassed agriculture in economic importance, with more than seven million tourists a year visiting Branson's celebrity theaters and attractions.

"Missouri." Encyclopedia Britannica 2007.

Missouri Disease Investigation / Emergency Response Districts



Source:
Missouri Department of Health and Senior Services

ITSD
TMS
HealthRegions.mxd
9-6-2009

Introduction

The Bureau of Communicable Disease Control and Prevention (BCDCP) provides prevention, intervention, and surveillance programs related to ninety-one reportable communicable (or infectious) diseases and conditions of public health significance in Missouri. Many of these diseases are emerging infections (such as Multi-drug resistant tuberculosis and paragonimiasis). The program also maintains a statewide surveillance system (WebSurv) and performs analysis of morbidity to identify trends and risk factors. In addition to WebSurv, Electronic Surveillance System for Early notification of Community-Based Epidemics (ESSENCE) is a statewide syndromic surveillance system that looks at chief complaints from hospitals, emergency rooms and over the counter drug sales, and receives data from the poison control centers. The BCDCP, working with the local public health agencies (LPHA's) strive to protect Missouri's citizens and visitors from the threats of infectious diseases of public health significance.

BCDCP services include:

- Conduct epidemiological studies to investigate the cause, origin, and method of transmission of communicable diseases in order to identify and implement appropriate disease control and preventive measures, such as contact identification, testing treatment, and source identification.
- Identify communicable disease surveillance data needs, design data collection processes/systems, develop and maintain data systems and datasets, analyze and interpret data at regular intervals to track trends and provide regular reports on these analyses to support targeted interventions.
- Consult with LPHA's, government at all levels, community organizations, hospitals, health care providers, private businesses, media, and others regarding diagnosis, and control measures for reportable communicable diseases and provide public health education as requested.
- Provide training and technical assistance/consultation to local health officials on disease investigations, control activities, and analysis/interpretation of data to prevent communicable diseases in their communities and rapidly respond to outbreaks.
- Provide community planning and rapid epidemiologic response for emergencies such as bioterrorism, pandemic influenza, and natural disasters such as flooding and earthquakes.
- Provide the treatment of tuberculosis (TB) disease or infection, as well as tuberculin skin testing materials for use in extended contact investigations and assisting LPHA's with TB case management.
- Provide assistance to local health officials in the screening and treatment of public health conditions in newly arriving refugees.
- Collaborate with other programs within the Missouri Department of Health and Senior Services, other state and federal agencies, and community-based organizations in emergency event planning and response.

The Department of Health and Senior Services (DHSS) rule for the **Reporting of Communicable, Environmental and Occupational Diseases**, can be found at: 19 CSR 20-20.020. This report contains information only for those diseases and conditions that are addressed by the BCDCP. Information and statistics for HIV, STD, and Hepatitis can be found by clicking on Bureau of HIV, STD, and Hepatitis.

Data used in this report were gathered from disease and condition reports made by medical providers, laboratories, hospitals, LPHA's, and others.

Introduction

The information collected through 19 CSR 20-20.020 flows from the local public health jurisdictions to DHSS and on to the national Centers for Disease Control and Prevention (CDC). Data are linked to the national level through the CDC's National Electronic Telecommunications Surveillance System (NETSS). This information is critical for two reasons:

- It enables public health agencies to act quickly to prevent the spread of disease, and
- It provides an overall picture of disease trends at the local, state and national levels. Analyzing these trends allows resources to be targeted where they are most needed and to assess effectiveness in preventing and controlling disease.

There are limitations to the data provided in this report for the following reasons:

- sick people do not always seek healthcare; and,
- healthcare providers and others do not always recognize, confirm, or report notifiable conditions.

Therefore, reported cases may represent only a fraction of the actual burden of disease.

BCDCP is pleased to provide the following summary of the data reported in calendar year 2009. In addition to the contributors listed on the previous page, the bureau would like to recognize the staff of our State Public Health Laboratories and the thousands of people in LPHA's, clinics, hospitals and clinical laboratories throughout Missouri whose disease reports and efforts constitute the basis for this document. Without vigilant reporting of disease, targeted and effective prevention and control measures cannot be implemented.

While this report was compiled by DHSS, please keep in mind that most of the public health workforce is in city or county health departments. Therefore, much of the work is at that level. The state, county, and city health departments and their private-sector partners work to promote health, protect against illness and injury, and render public health services to all people in Missouri.

A table of all reported notifiable diseases is located **here**. Where spatial analysis and use of Geographic Information Systems (GIS) was useful, maps have been provided to depict the data. Hyperlinks to additional information are included throughout the document.

We hope that you find this report informative and useful. We invite your questions and comments on this report, "Communicable Disease Surveillance 2009 Annual Report".

Harvey L. Marx, Jr.
Chief, Bureau of Communicable Disease Control and Prevention

"Without health there is no happiness. An attention to health, then, should take the place of every other object." — Thomas Jefferson, 1787

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Executive Summary

Every year in Missouri, communicable disease investigation and control efforts demand a substantial amount of public health resources; in 2009, it was no different. A total of 46,471[1] conditions were reported, investigated, the data entered into Missouri's communicable disease registry (WebSurv), which is later transmitted to CDC. The information from WebSurv provides valuable surveillance information used both locally and feeds into national disease surveillance programs.

The following document represents a summary of the diseases of public health significance in our communities; our hope is the information can be used to prevent additional cases.

Any document summarizing the 2009 public health experience would be remiss if H1N1 was not mentioned. April 21, 2009 marked the beginning of the 2009 Influenza A H1N1 pandemic. The 2009 Influenza A H1N1 pandemic necessitated the activation of several components of the state and local emergency response system. The DHSS activated its command and control center, the department situation room (DSR) from April 27, 2009 through May 7, 2009. However, the DSR continued to field calls related to the H1N1 pandemic until DHSS contracted with the Missouri Regional Poison Center to handle H1N1 calls through an established hotline that became known as the Missouri H1N1 InfoLine. In October 2009, the Nurse Hotline was reactivated for a week to respond to an influx of calls. Increased surveillance for diagnosed influenza cases and influenza-like illness (ILI) in ESSENCE was established as well as enhanced laboratory testing capability and capacity. By May 12, 2009, the Missouri State Public Health Laboratory (SPHL) had received certification from CDC to test respiratory specimens for the novel influenza strain. Staff at the SPHL conducted polymerase chain reaction (PCR) and/or viral culture tests on more than 1,200 specimens between October 2008 and September 2009 (three times the quantity of specimens tested during a typical influenza season).

The SPHL continues to provide technical assistance through not only consultations but also through the specialized testing methods they employ. In 2009, the SPHL performed 3,064,400 analyses in support of many diverse public health programs and also conducted specialized procedures as a reference laboratory. Those analyses are not only done for Missouri residents but can include residents from other states as well. Their advanced network with other states allows us to more readily identify potential outbreaks through the Pulse Net surveillance system.

Although H1N1 was featured in local and national media reports, other respiratory illnesses caused significant morbidity and hospitalization among Missourians. Legionellosis incidence remained elevated in comparison to recent years, with persons over 65 making up the largest affected age group. Reports of

[*] The figure "46,471" refers to all reportable communicable diseases that are monitored by the Bureau of Communicable Disease Control and Prevention. This does not include sexually transmitted diseases, HIV/AIDS, Hepatitis B (acute and chronic), Hepatitis C (acute and chronic) and conditions that are not infectious. Separate reports are available from DHSS for these diseases/conditions.

Executive Summary

active TB cases decreased for the second consecutive year in Missouri, but resource-intensive control efforts continued to be both necessary and costly. Outbreaks of influenza-like and respiratory illness of unknown etiology struck child care centers, schools and nursing homes, and pertussis morbidity topped the five-year median by more than 80%. Other vaccine-preventable maladies, such as chickenpox and pneumococcal disease, also contributed significantly to the overall disease burden in Missouri.

Measles (Rubeola), another vaccine preventable disease that is typically not commonly reported in Missouri, asserted its presence in 2009. In the spring of 2009, the virus infected a person traveling home to Missouri from the East coast, infected other unvaccinated persons in Missouri, and one measles case soon begot five additional cases (six cases total).

When public health officials were not investigating serious rash illnesses, many spent significant time investigating reports of shigellosis in child care centers. The investigation and control of norovirus outbreaks (confirmed and suspected) also consumed a lot of public health resources in 2009.

Tickborne illness also affected Missourians in 2009 and a new condition, previously not reported in Missouri, paragonimiasis. Ehrlichiosis incidence dropped a bit between 2008 and 2009, in Missouri, but we continue to exceed the national incidence rate by a substantial margin. Animal bite reports necessitated over 6,969 investigations by LPHA's, with subsequent recommendations for rabies post-exposure prophylaxis in many cases. The SPHL tested 3,388 animal specimens for rabies (65 of which were positive). Rabid animals were identified in all regions of the state. In 2009, Missouri health care providers identified three cases of the parasitic infection, paragonimiasis, which is caused by the ingestion of a lung fluke that has a propensity to be found in an aquatic arthropod common in Missouri (crayfish or crawdads). *Please, don't eat raw crawdads.*

For more information on the hazards of consuming uncooked crayfish, the impact of influenza in Missouri, and other topics from 2009, you'll have to turn the page. None of the work accomplished this year would have been possible without the passion and dedication of our partners at LPHA's. All of their public health efforts helped protect Missourians, and contributed substantially to the creation of this document.

Section A - Communicable Disease Surveillance

Disease Outbreaks

The BCDCP maintains a database and provides on-site and technical assistance to the LPHA's on reported outbreaks. The bureau staff review outbreaks for lessons learned and any new information on disease reservoirs, modes of transmission, control strategies and provide data to CDC for national analysis.

Diseases and Conditions	Number of Outbreaks	Diseases and Conditions	Number of Outbreaks
Gastrointestinal		**Vaccine Preventable**	
Acute Gastrointestinal Illness - etiology unknown	28	Chickenpox	6
Clostridium difficile	1	Pertussis	7
E. coli O157:H7	3	Rotavirus	1
Norovirus	9	**Total**	**14**
Salmonellosis	7		
Shigellosis (*S. sonnei*)	10	**Other**	
Total	**58**	Aseptic Meningitis	1
		Haemophilus influenzae	1
Respiratory		Methicillin-resistant *Staphylococcus aureus*	1
Acute Respiratory Illness	1	Rash - etiology unknown	3
2009 H1N1	8	Scabies	5
Influenza A	1	**Total**	**11**
Influenza-like illness	16		
Upper Respiratory Illness	1		
Total	**27**		
	Total Outbreaks	**110**	

Diseases of Note

There are several notable decreasing and increasing disease trends as reflected in the 15 year report.

Decreasing Trends:

- Salmonellosis, with 657 cases reported in 2009, decreased 14% , as compared to the five-year median of 764 cases.
- *E. coli* O157:H7, with 68 cases reported in 2009, decreased 10.5% from the 2008 total of 76 cases reported. This is the third consecutive year there has been a decrease in the number of reported cases of *E. coli* O157:H7.

Increasing Trends and/or Significant Increases:

- Influenza, with 30,567 cases reported in the 2009-2010 season, increased 174.5% from the 11,137 cases reported in 2008-2009 season. This increase is due to the 2009 Influenza A H1N1 pandemic. For additional information on Influenza, click here.
- Pertussis, with 1,015 cases reported in 2009, increased 80.9% from the 561 cases reported in 2008, which is the same increase from the five-year median. There were seven reported outbreaks of pertussis for 2009. For additional information on Pertussis, click here.

Section A - Communicable Disease Surveillance

Comparative Statistics, Reported Diseases, Missouri 2009

Reportable Diseases & Conditions entered into the Misouri Health Surveillance Information System (WebSurv)	Case Count 2009	5-Year First Quartile	5-Year Median	5-Year Third Quartile	% Change from 5-Year Median	Rate per 100,000
Adult Respiratory Distress Syndrome (ARDS)	3	0	1	1	200.00%	0.1
Animal Bites	6,969	4,533	4,952	5,348	40.70%	117.9
Blastomycosis	1	3	5	6	-80.00%	0
Botulism Infant	2	0	1	1	100.00%	0
Brucellosis	1	1	1	2	0.00%	0
Campylobacteriosis	770	714	722	745	6.60%	13
Chlamydia	25,868	22,371	22,982	23,308	12.60%	437.6
Coccidioidomycosis	11	3	3	3	266.70%	0.2
Creutzfeldt-Jakob Disease (CJD)	8	3	3	5	166.70%	0.1
Cryptosporidiosis	193	195	214	246	-9.80%	3.3
Dengue Fever	5	0	3	3	66.70%	0.1
E Coli Shiga Toxin Positive	75	26	72	77	4.20%	1.3
E. Coli (All)	143	124	152	153	-5.90%	2.4
E. Coli O157 H7	68	76	80	90	-15.00%	1.2
Ehrlichiosis (All)	167	70	99	222	68.70%	2.8
Encephalitis Lacrosse	1	0	0	0	N/A	0
Giardiasis	524	515	522	548	0.40%	8.9
Gonorrhea	6,488	9,218	9,455	9,876	-31.40%	109.8
HIV Disease	536	516	520	575	3.10%	9.1
Haemophilus Influenzae, Invasive	63	39	42	43	50.00%	1.1
Hemolytic Uremic Syndrome	7	8	9	13	-22.20%	0.1
Hepatitis A Acute	27	32	34	45	-20.60%	0.5
Hepatitis B (Pregnancy) Prenatal	136	123	125	133	8.80%	2.3
Hepatitis B Acute	47	40	62	159	-24.20%	0.8
Hepatitis B Chronic Infection	239	328	341	342	-29.90%	4
Hepatitis C, Chronic Infection	4,843	3,811	4,463	4,831	8.50%	81.9
Influenza Death lt 18 Years	4	0	0	0	N/A	0.1
Influenza***	30,567	11,137	12,991	14,845	135.30%	517.1
Legionellosis	65	31	34	50	91.20%	1.1
Leptospirosis	1	0	0	1	N/A	0
Listeriosis	14	6	8	11	75.00%	0.2
Lyme	10	10	13	17	-23.10%	0.2
Malaria	14	8	14	18	0.00%	0.2
Measles	6	0	1	2	500.00%	0.1
Meningococcal Disease	27	18	20	26	35.00%	0.5
Mumps	15	4	8	12	87.50%	0.3
Pertussis	1,015	308	561	595	80.90%	17.2
Q Fever (All)	3	5	11	12	-72.70%	0.1
Rabies Animal	65	59	64	66	1.60%	N/A
Rabies Post Exposure Prophylasis	232	13	159	259	45.90%	3.9
Rocky Mountain Spotted Fever	253	128	163	315	55.20%	4.3
Salmonellosis	657	764	764	766	-14.00%	11.1
Shigellosis	1,046	227	658	1,017	59.00%	17.7
Staph Aureus VISA	8	1	1	3	700.00%	0.1
Strep Disease, Group A Invasive	94	74	91	91	3.30%	1.6
Strep Pneumoniae, Drug-Resistant	74	37	44	65	68.20%	1.3
Strep Pneumoniae, lt 5 Years, Invasive	41	16	18	29	127.80%	0.7
Syphilis, Primary and Secondary	173	147	168	224	3.00%	2.9
Tetanus	2	0	2	2	0.00%	0
Toxic Shock (Staph) Syndrome	4	2	3	3	33.30%	0.1
Toxic Shock (Strep) Syndrome	2	1	1	2	100.00%	0
Tuberculosis	80	107	108	118	-25.90%	1.4
Tuberculosis Infection	3,393	3,573	3,837	3,886	-11.60%	57.4
Tularemia	13	21	27	28	-51.90%	0.2
Typhoid Fever	7	2	2	2	250.00%	0.1
Varicella (Chickenpox)	573	774	944	1,431	-39.30%	9.7
West Nile Fever and Viral Encephalitis-Meningitis	5	30	36	63	-86.10%	0.1
Yersiniosis	15	6	9	10	66.70%	0.3

**Not a reportable disease in at least 2 of the last 5-years. The count mean of the years reported is used in this situation if available.
***Influenza is reported based on the Influenza Season Year. 2009 includes Weeks 40 to 52 of 2009 and Weeks 1 to 20 of 2010.

Section A - Communicable Disease Surveillance

Ehrlichiosis (All)†

(*Ehrlichia* and *Anaplasma* Infections)

Click to view maps

Human ehrlichiosis and anaplasmosis are tick-borne diseases caused by several closely -related bacteria. The bacterium is maintained in nature in parasite-host cycles involving ticks and mammals. Human infections are usually the result of a bite from an infected tick; however, a case of blood transfusion-transmitted anaplasmosis was documented recently in Minnesota. The bacterial agents that cause ehrlichiosis, *Ehrlichia chaffeensis* and *E. ewingii,* are carried by the lone star tick, with the majority of disease reports coming from the southeastern and south central United States. Anaplasmosis is caused by *Anaplasma phagocytophilum*, which is carried by the deer or blacklegged tick, the same tick responsible for Lyme disease transmission. In a geographic pattern similar to Lyme disease, human anaplasmosis is identified most frequently in eastern and north central states and in Pacific coast states.

Table 1. Ehrlichiosis (All)†, Compartative Statistics, by Socio-demographic Category, Missouri[1] 2009

		Case Count 2009	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		167	100.00%	2.8	99	68.70%
Sex	Female	59	35.30%	2	32	84.40%
	Male	108	64.70%	3.7	72	50.00%
Race	Black	3	1.80%	0.4	2	50.00%
	Other	2	1.20%	1.5	0	N/A
	Unknown	12	7.20%	N/A	27	-55.60%
	White	150	89.80%	3	57	163.20%
Age Group	00 to <01	0	0.00%	0	0	0.00%
	01 to 04	1	0.60%	0.3	2	-50.00%
	05 to 14	9	5.40%	1.2	3	200.00%
	15 to 24	8	4.80%	1	5	60.00%
	25 to 39	23	13.80%	2	10	130.00%
	40 to 64	68	40.70%	3.5	49	38.80%
	65 plus	58	34.70%	7.2	33	75.80%
District	Central	38	22.80%	5.9	25	52.00%
	Eastern	52	31.10%	2.3	18	188.90%
	Northwest	16	9.60%	1	23	-30.40%
	Southeast	14	8.40%	3	4	250.00%
	Southwest	47	28.10%	4.6	32	46.90%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System (WebSurv)

Following transmission into the human host, *Ehrlichia* and *Anaplasma* bacteria infect white blood cells, spreading through the bloodstream to various tissues, possibly including the liver, spleen, kidney, heart, lymph nodes, and bone marrow. The onset of symptoms usually begins one to two weeks after the bite of an infected tick. High fever and severe headache are the most commonly reported symptoms, sometimes with shaking chills, muscle pain, nausea, vomiting, diarrhea, confusion, red eyes, rash, and tiredness. Characteristic clinical laboratory findings include a low platelet count, a decrease in the number of white blood cells, and elevated liver enzymes.

Ehrlichiosis can lead to life-threatening illness in otherwise healthy adults and children. People over the age of 40 and people undergoing immunosuppressive therapy or with a preexisting immunosuppressive condition are especially vulnerable to serious infections and hospitalization. Some infected people, however, never develop symptoms, and others experience only mild symptoms that resolve without treatment. The greatest challenge to health care providers is diagnosing ehrlichiosis early in the course of illness, when antibiotic therapy is most effective. *Doxycycline* is the first line treatment for adults and children of all ages, and should be initiated immediately when ehrlichiosis is suspected.

Section A - Communicable Disease Surveillance

Ehrlichiosis (All) - Continued

Statewide in 2009, Missouri identified 167 cases of ehrlichiosis (all)†, reflecting a 68.7% increase from the five-year median of 99 cases. The incidence of ehrlichiosis in men was about twice that of women, with 3.7 reported illnesses per 100,000 men compared with 2 cases per 100,000 in women. An overrepresentation of males diagnosed with ehrlichiosis has been observed at the national level as well, and may be due to men having greater exposure to ticks through occupational and recreational activities.

A consistent trend in state and national ehrlichiosis surveillance is the disproportionate toll in incidence the disease inflicts on people age 40 and older. This segment of the population tends to be more susceptible to severe infection, complications, and hospitalization. Of the 167 cases identified in 2009, individuals age 40 and older accounted for over 75% of the state's reports. Epidemiologists project that this age-differential effect in ehrlichiosis incidence will continue, if not increase, in the next two decades, due to the advancing age of baby-boomers as well as people receiving immunosuppressive therapies or suffering from auto-immune or infectious conditions that weaken the immune system. A small segment of Missouri's ehrlichiosis cases (10 cases or approximately 6%) were identified in children under the age of 15.

Across the State of Missouri, the distribution of ehrlichiosis (all)† cases was heavily weighted in two DHSS Communicable Disease Prevention and Control Districts, with an almost four-fold increase in reports over the five-year median for the Southeast District and an almost three-fold increase for the Eastern District. In contrast, the Northwest District saw a decrease in the number of reports compared with the five-year median. Both the Southwest and Central Districts experienced modest increases in ehrlichiosis reports over the median. Unfortunately, there are no independent measures of the geographic distribution of tick density or infection prevalence, so it is not known whether these regional variations in disease incidence are significant. It should be remembered that elevations in incidence and relative rates at the county level can be the result of a single case being identified in one of Missouri's more sparsely populated counties.

Comparison to National Data: During the previous five year period of 2004-2008, Missouri's ehrlichiosis incidence rate has been consistently higher than the corresponding national rate. The state's yearly incidence rates began increasing markedly over national rates beginning in 2006. The trend of yearly increases, however, was interrupted in 2009, with the statewide incidence rate dropping to 2.8 cases per 100,000 population, a drop from Missouri's highest previous incidence rates of 3.8 and 3.9 in 2007 and 2008, respectively. Overall, rates for both Missouri and the nation are on an upward trend, Missouri's rate of 2.8 cases per 100,000 population is still above the national rate of 0.7 per 100.000 population in 2008.

Increases in reports of ehrlichiosis over the past several decades are a result of changes in a complex of environmental, biological, demographic, and exposure factors. Field research has demonstrated that a key factor is the increase in lone star tick population density coupled with the increase in reservoir host (i.e., white-tailed deer) populations for *E. chaffeensis*. In addition, ehrlichiosis has increasingly been identified an expanding population segment that is immune-suppressed through aging, infectious diseases, malignancy, or medical therapy. Increased human contact with natural foci of infection through

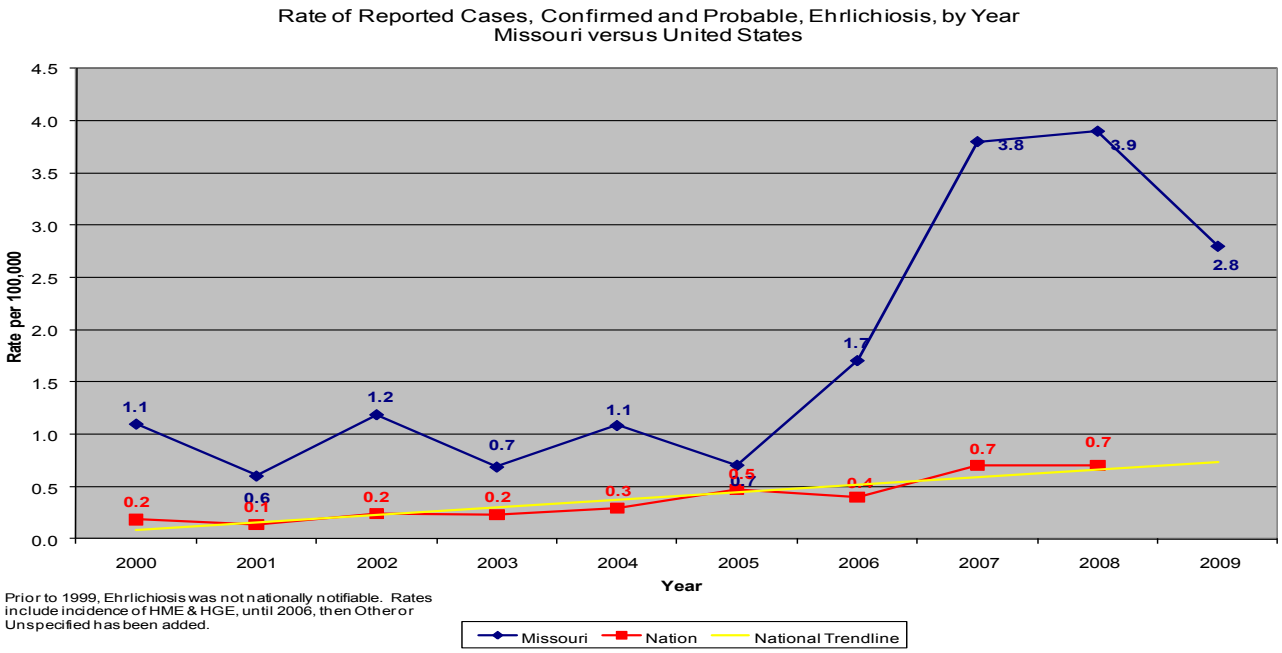
Section A - Communicable Disease Surveillance

Ehrlichiosis (All) - Continued

recreational and occupational activities is also a contributing factor, as well as health care providers' increasing awareness of the disease. Electronic reporting of laboratory results to health departments permits more efficient disease reporting.

Tick control through the use of pesticides, unlike mosquito control, is not feasible at the community level. Most pesticides effective against ticks also kill beneficial insects, making control efforts in residential yards problematic for many consumers. With these limitations in mind, prevention of ehrlichiosis and other tick-borne disease is generally focused on preventing tick bites. If your work or recreation takes you to areas with lots of ticks:

- Wear Light-colored long pants, long sleeves, and socks.
- Apply insect repellents with 20% - 50% DEET on skin and clothing.
- Children two months and older, use a repellent with 30% DEET or less.
- Check frequently for ticks.
- Use fine-tipped tweezers to grab an attached tick close to skin and pull straight up with a steady motion until removed.
- Do not squeeze or crush the body of the tick because this may force infective body fluids through into mouth parts and into wound site.
- Do not apply solutions such as petroleum jelly, finger nail polish, finger nail polish remover, repellents, pesticides, or a lighted match to the tick while it is attached. This may cause the tick to free more infective fluid into the wound site.



Section A - Communicable Disease Surveillance

Ehrlichiosis (All) - Continued

Generally, a tick needs to be attached to a human host for an extended period before transmitting *Ehrlichia* or *Anaplasma*. Showering after tick exposure followed by a change of clothes increases the likelihood that an attached tick is found and removed promptly. Tick mouth parts may remain in the skin. Embedded mouth parts are comparable to having a splinter in your skin. Mouth parts alone do not transmit disease. However, it is best to remove them to prevent the chance of secondary infection. The tick bite site should be washed with soap and water and checked periodically for signs of secondary infection. People who experience an allergic reaction to tick bites can apply a topical antihistamine or hydrocortisone. People should consider contacting their health care provider if sudden, severe symptoms develop following a tick bite or even after spending time in grassy, brushy environments where ticks are seeking hosts.

†For simplicity in public health disease yearly reporting, DHSS combines cases of illnesses caused by *Ehrlichia* and *Anaplasma* species into an "ehrlichiosis, all" category. In contrast to the tick-borne spotted fevers and tularemia, human *Ehrlichia* and *Anaplasma* species infections were recognized only in the last 25 years, so the surveillance criteria has necessarily evolved as medical and scientific understanding increases. Prior to 1999, ehrlichiosis was not a nationally notifiable disease. The rates for 2000 - 2005 combine reports of anaplasmosis and *E. chaffeensis* disease. Since 2006, rates have included additional newly identified *Ehrlichia* species infections, including *E. ewingii* infection, as well as reports where diagnostic testing could not distinguish between ehrlichiosis and anaplasmosis.

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Section A - Communicable Disease Surveillance

Influenza

Click to view maps

Influenza (the flu) is a contagious respiratory illness caused by influenza viruses. It can cause mild to severe illness, and at times can lead to death. There are three types of influenza viruses, types A, B and C, with influenza A viruses being the most severe. Influenza is characterized by abrupt onset of fever, often with chills or rigors, headache, malaise, diffuse myalgia, and nonproductive cough. Subsequently, as symptoms progress, sore throat, nasal congestion, rhinitis, and cough become more prominent.

Table 1. Influenza 2009-2010 Season-to-Date and 5-season Median by Influenza Type

Influenza Type	2009-2010 Season	% of Total	5-Season Median	% Change from 5-Season Median
Influenza A	27,454	89.8%	8,794	212.2%
Influenza B	553	1.81%	2,211	(75.0%)
Influenza Unknown Or Untyped	2,560	8.38%	3,474	(26.3%)
Total	30,567	100%	12,991	135.3%

Data Source: Missouri Health Surveillance Information System (WebSurv)

Influenza affects the health of a large number of people every year. Most people recover within a week, but a cough and tiredness can linger for two weeks or longer. Dehydration, bronchitis, and bacterial pneumonia, are examples of complications from flu. The flu can make chronic health problems worse. For example, people with asthma may experience asthma attacks while they have the flu, and people with chronic congestive heart failure may have worsening of this condition that is triggered by the flu. Children may get sinus problems and ear infections as complications from the flu. Those persons 65 years and older, children under the age of two, and persons of any age with chronic medical conditions are at highest risk for serious complications of flu. In the United States, influenza and pneumonia combined are among the top 10 leading causes of death. On average, influenza is annually associated with more than 36,000 deaths and more than 200,000 hospitalizations. In Missouri, influenza and pneumonia are associated with approximately 1,500-3,000 deaths per year. In addition to the loss of life associated with influenza, the economic impact of is staggering. Studies have shown that in an average year, direct and indirect medical costs in the United States are in the billions of dollars.

The influenza season is defined as the period between week 40 (first week of October) of one year and week 20 (middle of May) of the next. The 2009-2010 season was not a typical influenza season, in April, 2009, which was at the end of the 2008-2009 flu season, a new strain of influenza A, now known as the 2009 H1N1 virus was detected in the United States. Because it was a new virus, surveillance was enhanced and the first cases of this new strain were detected in Missouri in late April and early May of 2009. Most people had no immunity to this virus so it easily spread across the world in a matter of weeks and on June 11, 2009 the World Health Organization (WHO) declared that a worldwide epidemic (pandemic) was underway. This was the first pandemic declared since 1968.

Section A - Communicable Disease Surveillance

Influenza - Continued

During the 2009-2010 season, 30,567 influenza cases were reported for a rate of 517.1 per 100,000 population. There were 27,454 type A (89.8%), 553 type B (1.81%), and 2,560 unknown or untyped (8.4%). The total number reported was 135.3% above the five-season median. The 2009 H1N1 Influenza A virus was the predominant strain that circulated during the 2009-2010 season, almost completely replacing other seasonal strains of influenza. Although the actual number of 2009 H1N1 cases that occurred in Missouri is difficult to assess, 99% of all influenza A isolates submitted nationally were characterized as 2009 H1N1, therefore, it is possible that 27,243 of the reported Missouri influenza A cases were 2009 H1N1. In comparison, during the 2008-2009 flu season, 11,137 influenza cases were reported. There were 6,000 type A (53.9%), 3,821 type B (34.3%) and 1,316 unknown or untyped (11.8%).

Table 2. Influenza 2009-2010 Season-to-Date and 5-season Median by Age Group

Age Group	2009-2010 Season	% of Total	5-Season Median	% Change from 5-Season Median
00-<02	2,099	6.9%	1,685	24.6%
02-04	3,715	12.2%	1,657	124.2%
05-14	14,091	46.1%	4,007	251.7%
15-24	4,668	15.3%	1,439	224.4%
25-49	4,359	14.3%	2,222	96.2%
50-64	1,294	4.2%	937	38.1%
65+	341	1.1%	1,470	(76.8%)
Total	30,567	100%	12,991	135.3%

Data Source: Missouri Health Surveillance Information System (WebSurv)

Due to the pandemic caused by the 2009 H1N1 Influenza A virus, Influenza A accounted for 89.8% of the cases, which is higher than previous years. Usually there are two distinct age groups who are at high risk for developing flu related complications; children younger than five years of age, especially children younger than two, and adults 65 years of age and older. During the 2009-2010 flu season, approximately 65.2 % of all reported cases were <15 years of age. This is likely due to the fact that many older adults were exposed to a similar virus many years ago thus affording them some protection against the 2009 H1N1 strain.

Those 50 years or above accounted for 5.3 % of all cases in Missouri. The age group of 15-24 and 25-49, accounted for 29.5%. There were thirteen (13) outbreaks reported during the 2009-2010 season, compared to the one outbreak reported during the 2008-2009 season. There were fifty-eight (58) school closures reported during the 2009-2010 season, compared to the three (3) closures reported during the 2008-2009 season.

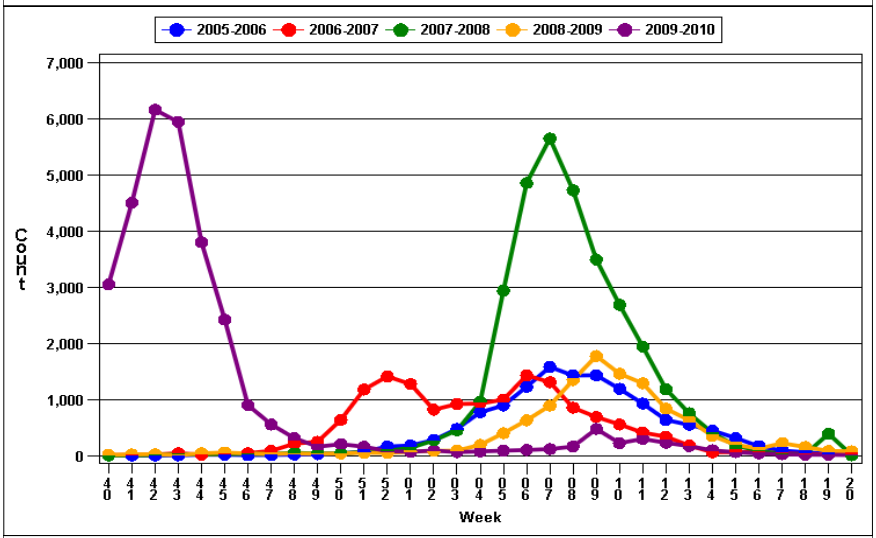
Pandemics often occur in waves and the first wave began in the spring of 2009, a second larger wave occurred in the fall with the number of people infected in Missouri peaking at the end of October, 2009. A much anticipated third wave never occurred, likely due to a diminished number of people susceptible to the virus. Experts predict that the new 2009 H1N1 Influenza A virus will continue to circulate for some time and will likely be one of the predominant seasonal influenza viruses.

Section A - Communicable Disease Surveillance

Influenza - Continued

The CDC estimates that in the U.S. approximately 61 million cases of 2009 H1N1 occurred between April 2009 and April 10, 2010. They also estimated that there were approximately 270,000 hospitalizations due to 2009 H1N1 and 12,270 deaths associated with this outbreak in the U.S. It was considered a mild pandemic because the death toll was below the usual 36,000 deaths associated with seasonal influenza. During the influenza pandemic 75% of cases were in persons <30 years of age and severe illness was in young children, pregnant women, and those with underlying illness.

Graph 1. Reported Influenza Cases 2009-2010 Season as compared to the previous four influenza seasons.



Data Source: Missouri Health Surveillance Information System (WebSurv)

A seasonal influenza vaccine, whose components were decided upon well in advance of the pandemic had been in production by the time the new 2009 H1N1 virus emerged. A second vaccine, to prevent the 2009 H1N1 virus was created to protect people against the new flu virus. This vaccine was licensed for use in persons six months of age to adult. When the 2009 H1N1 first became available in October, 2009, supplies were limited. For this reason, CDC's Advisory Committee on Immunization Practices (ACIP) recommended that people at highest risk for complications from this virus, or those caring for high risk individuals who cannot receive vaccination, receive the vaccine first. These target groups included pregnant women, people who live with or care for children younger than 6 months of age, health care and emergency medical services personnel, anyone 6 months through 24 years of age, and people ages of 25 through 64 years of age at higher risk for 2009 H1N1 influenza because of certain chronic health conditions or compromised immune systems.

The recommendation that children younger than 10 years old receive two doses of 2009 H1N1 vaccine was based on studies of immune response to the vaccine as measured by levels of protective antibodies in the blood. After one dose of vaccine, infants and young children do not make as many antibodies compared with older children and adults who get one (1) dose.

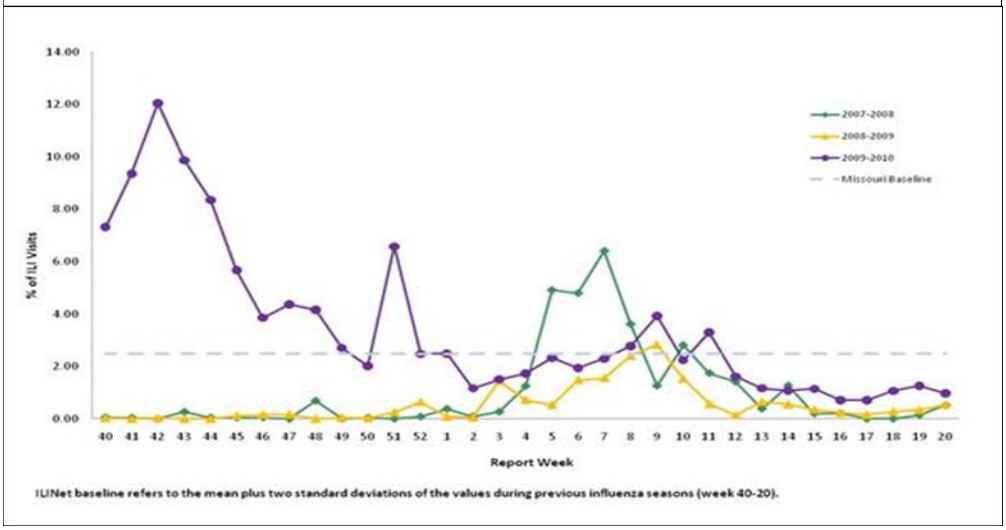
Section A - Communicable Disease Surveillance

Influenza - Continued

Comparison to National Data: Individual cases of influenza are not a nationally notifiable disease; therefore, comparison to national data cannot be done. However, data from the weekly percentage of outpatient visits for ILI, as reported by the U.S. Outpatient ILI Surveillance Network (ILINet), is comparable. Nationally, the weekly percentage of outpatient visits for ILI peaked at the end of October at 7.6%, a level higher than the three previous seasons. Missouri's ILI weekly percentage also peaked around the same time (week 42, ending October 24, 2009) at 12.04%, well above Missouri's baseline of 2.47%. In most seasons, influenza activity peaks in January and March.

In Missouri, the number of cases for the 2009-2010 influenza season was higher than the previous four seasons. The pandemic, increased testing by physicians, and improved availability of rapid tests all contributed to the increased number of cases. Laboratory-confirmed cases of influenza are not reportable nationwide so national data are unavailable for comparison.

Graph 2. Percentage of Visits for Influenza-like-Illness (ILI) Reported by the Missouri Outpatient ILI Surveillance Network (ILINet) 2009-2010 as compared to the previous Two Influenza Seasons



ILINet baseline refers to the mean plus two standard deviations of the values during previous influenza seasons (week 40-20).

In addition to prudent and appropriate vaccinations, studies clearly show that simple preventive measures are effective in lowering a persons risk of contracting flu and reducing the spread of flu viruses. These measures include hand washing, cough/sneeze etiquette, and staying home when ill. More information on flu prevention can be found at: http:// www.health.mo.gov/Influenza/.

Additional Website Resources

CDC Health Topics | CDIRM | Health Region Defined

Section A - Communicable Disease Surveillance

Legionellosis

Click to view maps

Legionellosis refers to conditions associated with the bacteria called *Legionella*. Although more than 50 species, with at least 70 serogroups, of *Legionella* are currently recognized, *Legionella pneumophila* serogroup 1 (*L. pneumophila*) accounts for up to 90% of human cases of the disease. The term legionellosis encompasses two very distinct clinical and epidemiological conditions called Legionnaires' disease and Pontiac fever.

Table 1. Legionellosis, Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State of Missouri		65	100.00%	1.1	34	91.20%
Sex	Female	25	38.50%	0.8	13	92.30%
	Male	40	61.50%	1.4	27	48.10%
Race	Black	12	18.50%	1.7	5	140.00%
	Unknown	11	16.90%	N/A	16	-31.30%
	White	42	64.60%	0.8	15	180.00%
Age Group	00 to <01	0	0.00%	0	0	N/A
	01 to 04	0	0.00%	0	0	N/A
	05 to 14	0	0.00%	0	0	N/A
	15 to 24	1	1.50%	0.1	1	0.00%
	25 to 39	3	4.60%	0.3	5	-40.00%
	40 to 64	36	55.40%	1.8	17	111.80%
	65 plus	25	38.50%	3.1	10	150.00%
District	Central	7	10.80%	1.1	2	250.00%
	Eastern	39	60.00%	1.7	17	129.40%
	Northwest	7	10.80%	0.5	10	-30.00%
	Southeast	4	6.20%	0.9	1	300.00%
	Southwest	8	12.30%	0.8	6	33.30%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

The natural reservoirs for the *Legionella* bacteria are aqueous and include lakes, streams, and coastal oceans. However, the bacteria thrive in warm water and can contaminate hot water systems including showers, air conditioning cooling towers, humidifiers, whirlpool spas, respiratory therapy devices, and decorative fountains, which have all been associated with disease. The bacteria do not seem to grow in car or window air conditioners. Persons become infected when *Legionella* bacteria that have been aerosolized in the air are inhaled into the lungs. Symptoms of disease usually begin 2-10 days following exposure for Legionnaires' disease and 5-66 hours following exposure for Pontiac fever. The initial symptoms often include anorexia, malaise, myalgia, headache, diarrhea, cough, and a high fever. Persons with Legionnaires' disease will typically develop pneumonia while Pontiac fever is a milder illness and is generally not associated with pneumonia. Most persons with Pontiac fever will recover fully while approximately 15% of cases of Legionnaires' disease will be fatal despite the improved diagnostic and treatment methods. The bacteria that cause legionellosis are not spread from one person to another person. Both sporadic cases and outbreaks of Legionnaires' disease are more commonly seen in the summer and autumn.

Legionnaires' disease was first identified in 1976 following an outbreak of pneumonia in persons who had attended an American Legion convention in Philadelphia. In the United States, an estimated 8,000 – 18,000 people are hospitalized with Legionnaires' disease each year and approximately 20% of cases are associated with travel.

Section A - Communicable Disease Surveillance

Legionellosis - Continued

Statewide in 2009, there were 65 cases of legionellosis reported, which was a 91% increase in the number of cases compared to the five-year median. The incidence rate for the year was 1.1 cases per 100,000 population and represents a slight decrease from the 2008 incidence rate. The cases ranged in age from 21 to 93 years of age with a mean age of 60 years. The age group specific incidence rate was highest among persons aged 65 years and older (3.1 per 100,000 population). Sixty-one percent of cases were male and the race specific incidence rates were similar among both blacks and whites.

Despite the slight decrease in the incidence rate from 2008 to 2009, Missouri remained above the previous five-year median with all but one district observing an increase over the previous five-year median. Central and Southeast districts had an increase of greater than or equal to 250%, Eastern district had an increase of 129% and Southwest district had an increase of 33%. Only the Northwest district showed a 30% decrease from the previous five-year median. Although legionellosis cases were reported during most months, 39% of cases were reported in the months of June and July. Twenty percent of Missouri's cases were associated with travel. Twenty-three percent were reported to have had either a suppressed immune system and/or an additional underlying health condition at the time they were diagnosed with Legionellosis. Fifty-two or 80% of Missouri's cases required hospitalization. There were no reported outbreaks due to Legionellosis in Missouri in 2009.

Comparison to national data: In 2008, the national rate per 100,000 population was 1.1 and the state had a rate of 1.1 per 100,000 population in 2009. The slight decline in the annual incidence rate of legionellosis cases in Missouri, from 2008 to 2009, was in contrast to the steady increase observed nationally. Despite the slight decrease in Missouri's reported legionellosis cases in 2009, the incidence rate of reported legionellosis cases remains equal to the national rate. The rates of reported legionellosis cases in Missouri and nationally have continued an upward trend over the past decade.

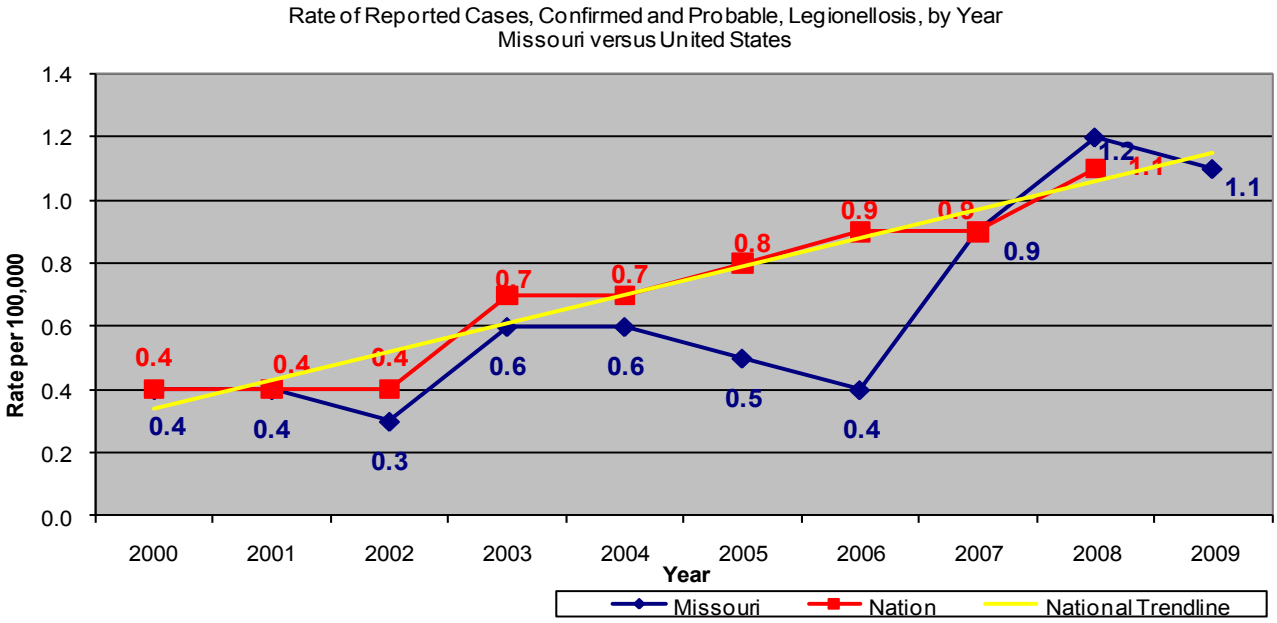
People most at risk of getting sick from the bacteria are older people (usually 65 years of age or older), as well as people who are smokers, or those who have a chronic lung disease (like emphysema). People who have weak immune systems from diseases like cancer, diabetes, or kidney failure are also more likely to get sick from *Legionella* bacteria. People who take drugs to suppress (weaken) the immune system (like after a transplant operation or chemotherapy) are also at higher risk.

About 21% of all Legionnaires' disease reported to CDC between 1980 and 1999 was travel-associate, and that number is rising as reporting improves. Legionnaires' disease is important to diagnose and to report because its identification implies the presence of an environmental source to which other susceptible individuals are likely to be exposed.

Section A - Communicable Disease Surveillance

Legionellosis - Continued

Outbreaks of legionellosis have been associated with hotels and other travel associated exposures and often resulting in severe disease. This highlights the importance of owners and operators to properly maintain water sources such as air conditioning cooling towers, spas, hot tubs, and the like, to prevent the growth and/or proliferation and spread of *Legionella* bacteria and therefore prevent legionellosis disease. The American Society of Heating, Refrigerating, and Air Conditioning Engineers has developed Guideline 12-2000 "Minimizing the Risk of Legionellosis Associated with Building Water Systems". Legionellosis case and outbreak investigations often require the expedient collaboration of local, state, federal, and international agencies to identify and eliminate sources of disease.



Additional Website Resources

CDC Health Topics

CDIRM

Health Districts Defined

Section A - Communicable Disease Surveillance

Measles

Click to view maps

Measles is a highly contagious respiratory disease caused by a virus of the same name. The disease may also be called rubeola. It is characterized by onset of fever, runny nose, cough and a rash starting on the face and moving downward on the body. Measles is spread through the air by breathing, coughing or sneezing.

Measles can be spread to others from four days before to four days after the rash appears. The virus lives in the mucus in the nose and throat of the infected person. When that person sneezes or coughs, droplets spray into the air. The droplets can get into other people's noses or throats when they breathe or put their fingers in their mouth or nose after touching an infected surface. The virus can live on infected surfaces for up to two hours. Measles is a highly contagious diseases. Those who are not immune and are exposed to measles will most likely develop the disease.

Table 1. Measles, Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State of Missouri		6	100.00%	0.1	1	500.00%
Sex	Female	3	50.00%	0.1	0	N/A
	Male	3	50.00%	0.1	0	N/A
Race	Black	0	0.00%	0	0	N/A
	White	6	100.00%	0.1	0	N/A
Age Group	00 to <01	0	0.00%	0	0	N/A
	01 to 04	0	0.00%	0	0	N/A
	05 to 14	2	33.30%	0.3	0	N/A
	15 to 24	4	66.70%	0.5	0	N/A
	25 to 39	0	0.00%	0	0	N/A
	40 to 64	0	0.00%	0	0	N/A
	65 plus	0	0.00%	0	0	N/A
District	Central	0	0.00%	0	0	N/A
	Eastern	6	100.00%	0.3	0	N/A
	Northwest	0	0.00%	0	1	-100.00%
	Southeast	0	0.00%	0	0	N/A
	Southwest	0	0.00%	0	0	N/A

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

According to CDC, about one in ten children with measles will also get an ear infection, and up to one in twenty will get pneumonia. For every 1,000 children who get measles, one to two will die.

Statewide in 2009, Missouri had six reported cases of measles for a rate of 0.10 per 100,000 population. The initial case attended a conference in Maryland and was exposed to an individual who was not aware they had the disease. The case returned to Missouri and transmitted the disease to five siblings. All six cases were located in the Eastern District, all were within the same family, and all were not vaccinated against measles.

Comparison to National Data: In 2009, Missouri had a rate of 0.10 per 100,000 population, well over the national rate of 0.05 per 100,000 population.

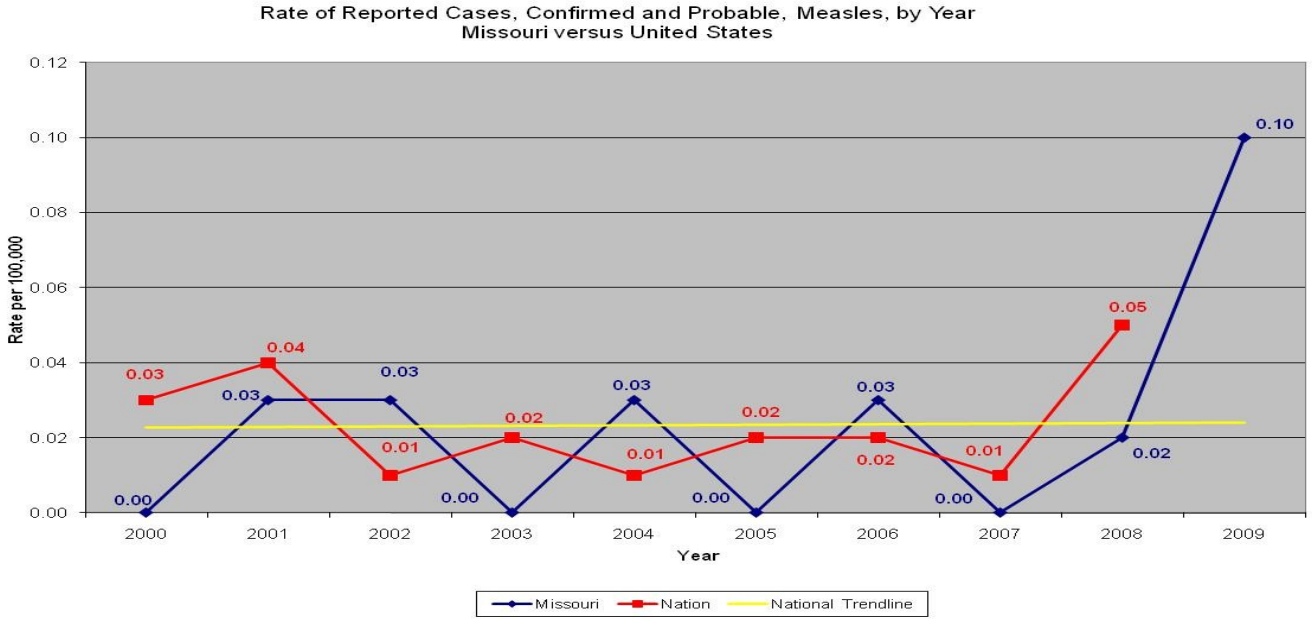
Section A - Communicable Disease Surveillance

Measles - Continued

The increase of measles cases in Missouri for 2009 was the result of a measles exposure in a non-immunized population. Immunity occurs through vaccination or acquiring the disease. There are sporadic cases of measles in the United Sates due to an increase in travel abroad and an influx of visitors to the United States from other countries. Those who travel abroad and those who visit countries where measles is endemic can become infected before or during travel and can spread the infection to unvaccinated or unprotected persons.

According to the Morbidity and Mortality Weekly Report dated August 22, 2008, measles is one of the first diseases to reappear when vaccination coverage rates fall. To prevent measles outbreaks requires a high overall measles, mumps, and rubella (MMR) vaccination coverage to limit the spread of measles. Many of the preventable cases of measles are in unvaccinated children.

The recent increase of measles cases demonstrates the need for public education by public health agencies and physicians to encourage immunization for all infants, children and adolescents. Persons who are traveling to an area where measles is endemic should follow-up with their health care provider to assure they are current with their immunizations and ensure that they have immunity to measles.



Additional Website Resources

CDC Health Topics | CDIRM | Health Districts Defined

Section A - Communicable Disease Surveillance

Paragonimiasis

Human paragonimiasis is a parasitic infection caused by the trematode *Paragonimus* (the lung fluke). Infection in humans mainly occurs by ingestion of raw or undercooked freshwater crabs or crayfishes. Paragonimiasis caused by *Paragonimus westermani* is common in East Asia where it is associated with ingestion of raw or marinated crabmeat. Paragonimiasis is uncommon among North Americans who have not traveled or lived in endemic areas in the far east. Most North American cases of paragonimiasis are caused by *Paragonimus kellicotti*,[1,2] a parasite that is common in crayfish in the central United States. including Missouri.

P. kellicotti infections have been reported in bobcats, raccoons, gray foxes, red foxes, skunks, mink, coyotes, cats, and dogs. *Paragonimus* species have complex life cycles that require two intermediate hosts, snails and crustaceans (ie, crabs or crayfish). Humans acquire *P. kellicotti* when they consume infected raw crabs or crayfish.

Humans with paragonimiasis usually present with fever and cough, which, together with the presentation of hemoptysis, can be misdiagnosed as tuberculosis. Pulmonary symptoms and fevers typically develop one or more months after ingestion of raw crabs or crayfish. The parasites sometimes migrate to ectopic locations such as subcutaneous tissue (presenting as migratory nodules) or even the central nervous system (with headache, seizures, or visual symptoms)[1].

Paragonimiasis was first recognized as a pathogen in North America in 1894. Drs. Ward and Kellicott described *Paragonimus* parasites in lung tissue from a dog in Ohio and a cat in Michigan[1,3,4]. Dr. Ward distinguished North American *Paragonimus* worms from those found in Asia, on the basis of differences in morphology, and named the new species *P. kellicotti.* Humans acquire *Paragonimus* infections when they consume uncooked shellfish, such as crabs and crayfish. People in parts of eastern Asia commonly eat raw or alcohol-cured crustaceans, and this explains the high incidence of paragonimiasis in that region.

Although paragonimiasis is not reportable in Missouri, in October 2009, DHSS initiated an investigation into three cases with proven or probable paragonimiasis seen at a single Missouri medical center during an 18-month period. All three patients had recently ingested raw crayfish from rivers in Missouri. It is likely that alcohol played a role in these three cases by relaxing normal dietary inhibitions (the consumption of raw crayfish). It is also likely that other patients with paragonimiasis have been misdiagnosed and improperly treated.

Section A - Communicable Disease Surveillance

Paragonimiasis - Continued

As a result of the investigation:

- A health alert was issued from DHSS to medical providers so they would consider paragonimiasis in patients who present with cough, fever, hemoptysis, and eosinophilia. DHSS also requested that all cases of paragonimiasis be reported.
- An Epi-X report was issued from DHSS to alert other states that paragonimiasis was identified in persons with exposure to raw crayfish from Missouri rivers.
- DHSS collaborated with the Division of Tourism and the Department of Natural Resources and developed an educational poster that was distributed to Missouri canoe rental and camping facilities to warn the public not to eat uncooked crayfish.

Comparison with National Data: In contrast to Asia, consumption of raw crustaceans is uncommon in North America. The distribution of *P. kellicotti* in North America has not been mapped in detail, since *P. kellicotti* is not a nationally notifiable disease or condition. However, the parasite is known to be widely distributed in the Midwest region of the U.S. Most previously reported cases have been from this region[1].

The infection is transmitted by eating crab or crayfish that is either, raw, partially cooked, pickled, or salted. Never eat raw freshwater crabs or crayfish. Cook crabs and crayfish to at least 145°F (~63°C). Travelers should be advised to avoid traditional meals containing undercooked freshwater crustaceans.

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1. Ward HB. On the presence of *Distoma westermanni* in the United States. Vet Mag 1894;1:355–7. Available at: http://digitalcommons.unl.edu/zoolabstud/2/
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Additional Website Resources

CDC Health Topics

CDIRM

Health Districts Defined

Section A - Communicable Disease Surveillance

Pertussis

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Pertussis, also known as whooping cough, is a highly contagious respiratory disease. It is caused by the bacterium *Bordetella pertussis*. Pertussis is only found in humans and is spread person to person. People with pertussis usually spread the disease by coughing or sneezing while in close contact with others, who then breathe in the pertussis bacteria. Pertussis can cause serious and sometimes life-threatening complications in infants and young children, especially those who are not fully vaccinated. Many infants who get pertussis are infected by older siblings, parents or caregivers who might not even know they have the disease.

Table 1. Pertussis, Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State of Missouri		1,015	100.00%	17.2	561	80.90%
Sex	Female	538	53.00%	17.8	311	73.00%
	Male	477	47.00%	16.5	250	90.80%
Race	Black	26	2.60%	3.7	27	-3.70%
	Other	12	1.20%	8.9	1	1100%
	Unknown	235	23.20%	N/A	122	92.60%
	White	742	73.10%	14.6	289	156.70%
Age Group	00 to <01	135	13.30%	166.8	74	82.40%
	01 to 04	113	11.10%	35.5	53	113.20%
	05 to 14	548	54.00%	71.1	216	153.70%
	15 to 24	55	5.40%	6.8	35	57.10%
	25 to 39	58	5.70%	5	34	70.60%
	40 to 64	88	8.70%	4.5	56	57.10%
	65 plus	16	1.60%	2	5	220.00%
	Unknown	2	0.20%	N/A	0	N/A
District	Central	149	14.70%	22.9	43	246.50%
	Eastern	551	54.30%	24.6	127	333.90%
	Northwest	174	17.10%	11.3	87	100.00%
	Southeast	72	7.10%	15.6	33	118.20%
	Southwest	69	6.80%	6.8	23	200.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

The disease usually starts with cold-like symptoms and a mild cough or fever. After 1 to 2 weeks, severe coughing can begin. Unlike the common cold, pertussis can become a series of coughing fits that continues for weeks. In infants, the cough can be minimal or altogether absent. Infants may have a symptom known as "apnea." Apnea is a pause in the child's breathing pattern. Pertussis is most dangerous for infants. More than half of infants younger than 1 year of age who get the disease must be hospitalized. Pertussis can cause violent and rapid coughing, over and over, until the air is gone from the lungs and you are forced to inhale with a loud "whooping" sound. This extreme coughing can cause you to throw up and be very tired. In teens and adults, especially those who have been vaccinated, the "whoop" is often not there and the infection is generally milder (less severe).

Pertussis is generally treated with antibiotics and early treatment is very important. Treatment can help prevent spreading the disease to close contacts (people who have spent a lot of time around the infected person) and is necessary for stopping the spread of pertussis. However, the best way to prevent pertussis is through vaccination. There are vaccines for children, pre-teens, teens and adults. The childhood vaccine is called DTaP, and the pertussis booster vaccine for adolescents and adults is called Tdap.

Section A - Communicable Disease Surveillance

Pertussis - Continued

Missouri experienced a significant increase in reported pertussis cases in 2009, appearing to be in one of the periodic cycles commonly seen with pertussis. Statewide, in 2009, there were 1,015 cases of pertussis reported in Missouri, which was an 80.9% increase from the 5-year median. The incidence rate for 2009 was 17.2 per 100,000 population and represents the highest incidence rate since 2005 (11.7 per 100,000). The cases ranged in age from < 1 year to > 65 years. The age group most affected was the 5 to 14 years of age, accounting for 548 of the 1,015 (54.0%) of cases. This group was followed closely by the 0 to <1 years of age (13.3%) and the 1 to 4 years of age group (11.1%). All districts across the state saw significant increases in the number of reported cases with the Eastern and Central districts seeing the largest increase, 333.9% and 246.5% respectively. Many factors contributed to the increased rates. There were seven reported outbreaks from school/college settings and child care centers.

Comparison to national data: Overall, there is a national trend upward in the number of pertussis cases reported in the United States. Missouri's state rate of 17.2 per 100,000 population in 2009 followed this upward trend. The annual incidence rate for Missouri of pertussis has consistently been above the national incidence rate until a slight decline in 2007. The decline was followed by a very rapid increase in the incidence of cases of pertussis which reached a new historic level of 17.2 per 100,000 population for 2009.

In 2009, nearly 17,000 cases of pertussis (whooping cough) were reported in the United States, but many more go undiagnosed and unreported. Worldwide, there are 30-50 million cases of pertussis and about 300,000 deaths per year. Since the 1980s, there has been an increase in the number of reported cases of pertussis in the United States, especially among 10-19 year olds and infants younger than 6 months of age. Pertussis is a common disease in the United States, with periodic epidemics every 3 to 5 years and frequent outbreaks.

Outbreaks of pertussis are often associated with child care centers and schools and spread rapidly to community wide situations. Because it is such a contagious disease, transmission often occurs before a proper diagnosis is made facilitating the increased counts of disease. Several factors have likely contributed to the increase in reported cases, including increased awareness and improved recognition of pertussis among clinicians, greater access to and use of laboratory diagnostics, especially PCR testing, and increased surveillance and reporting of pertussis to public health departments. Even with these improvements, it is believed that much of the disease goes unrecognized and unreported.

Pertussis is a highly communicable disease and acquisition rates approach 80% in susceptible household contacts. Pertussis incidence has gradually increased since the early 1980s nationally. Previously, the incidence of pertussis nationally was primarily in infants younger than 1 year of age, and particularly among children younger than 6 months of age. However, in recent years adolescents (11-18 years of age)

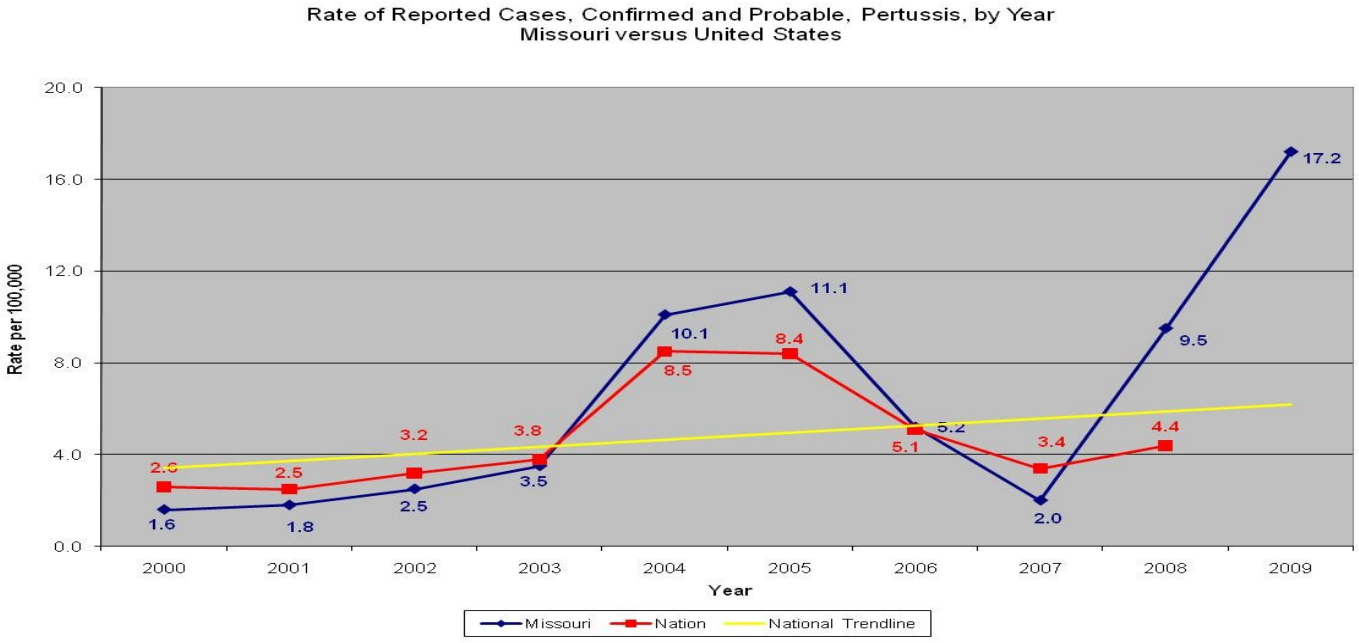
Section A - Communicable Disease Surveillance

Pertussis - Continued

and adults (19 years of age and older) have accounted for an increasing proportion of cases. In 2004 and 2005, approximately 60% of reported cases nationally were among persons 11 years of age and older.

Studies show that the prevalence of pertussis among adolescents and adults with prolonged-cough illness may be as high as 50%. Many of these cases can go unrecognized and untreated, facilitating persistence and spread through the communities.

Even though the resurgence in reported cases is due, in part, to increased recognition and diagnosis of pertussis in older age groups; better diagnostic testing and increased case finding, an important factor to consider is waning immunity in older individuals. Protection from childhood immunization and even from natural infection of pertussis wanes after about 5 to 10 years. With the approval of Tdap vaccines for adolescent and adults in 2005, booster immunizations became a possibility. In 2006, Tdap was recommended for adolescents and adults in the United States. For the 2010-2011 school year, Missouri made it a requirement that 8th graders receive a booster dose of Tdap. Many other states have implemented similar strategies. The best way to prevent pertussis (whooping cough) among infants, children, teens, and adults is to get vaccinated. Also, keep infants and other people at high risk for pertussis complications away from infected people. In addition, pertussis is generally treated with antibiotics, which are used to control the symptoms and to prevent infected people from spreading the disease to others.



Additional Website Resources

CDC Health Topics | CDIRM | Health Districts Defined

Section A - Communicable Disease Surveillance

Rabies, Animal and Human
Rabies Post-Exposure Prophylaxis (PEP) Initiated

All Species Map
Wild Species Map
Domesticated Species Map
PEP Map

Rabies is a fatal viral illness that affects only mammals. Although there is great variability in the susceptibility of various species to infection with this virus and subsequent manifestation of disease, any mammal may be infected with the rabies virus and serve as a source of infection for other mammals. Virus is typically present in the saliva of clinically ill mammals and is most often transmitted through a bite. After entering the central nervous system of the next host, the virus causes an acute, invariably progressive encephalomyelitis that is almost always fatal. The incubation period in animals and humans is usually several weeks to months, but may range from days to years. Rabies has the highest case fatality ratio of any infectious disease if prompt intervention is not initiated in the case of humans; there is no postexposure intervention for animals. Laboratory testing for rabies is useful for confirmation of the virus' presence in certain species and geographic locations, and for determination of the need to administer rabies prophylaxis in cases of human exposure to a potentially rabid animal. The only reliable method of testing animals for the presence of rabies virus is through laboratory analysis of brain tissue. Public health surveillance for this disease in domestic and wild animal populations is a valuable tool in the prevention of human rabies cases.

Table 1. Animal Rabies, by Species, Missouri 2009

Species	Number Examined	Number Positive	Percent Positive
Bat	1,626	49	3.00%
Cat	622	1	0.20%
Cow	26	0	0.00%
Dog	760	0	0.00%
Exotic	1	0	0.00%
Ferret	2	0	0.00%
Fox	10	0	0.00%
Horse	17	0	0.00%
Other Domestic	12	0	0.00%
Other Wild	47	0	0.00%
Raccoon	131	0	0.00%
Rodent/Rabbit	88	0	0.00%
Skunk	46	15	32.60%
Total	3,388	65	1.90%

Rabies (Animal)

During 2009, 65 cases of animal rabies were detected in Missouri, compared to 64 cases the previous year, representing a 1.6% increase. Animals found to be rabid in Missouri during 2009 included 49 bats, 15 skunks, and 1 cat. The number of specimens tested in 2009 was 3,388, with 65 found positive, giving a positivity rate of 1.9%. In 2008, 64 of 3,160 submitted specimens tested positive, yielding a 2.0% positivity rate. The annual number of rabies cases during the preceding ten years (1999-2008) ranged from a low of 31 cases in 1999 to a high of 73 cases in 2005. The median number of cases per year during this time period was 47.5.

The number of rabid animals detected each year varies according to several parameters, including awareness on the part of the public and health community regarding this disease, the willingness and ability of agencies and individuals to submit specimens for testing, competing interests, financial constraints and,

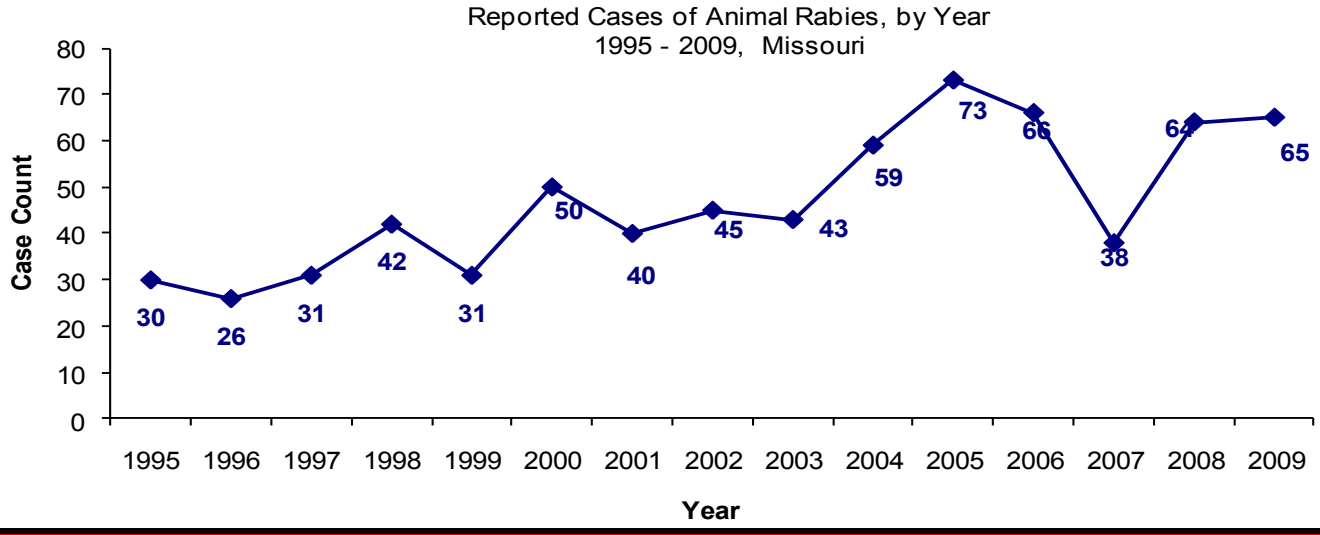
Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

of course, the actual incidence of rabies in wildlife. As with most diseases having wild animals as the reservoir, the number of rabies cases goes through a cycle of "troughs" and "peaks" over a period of several years. Peaks usually correspond to the infection of large numbers of immunologically naïve animals that result when populations increase due to favorable environmental conditions, decreased human intervention (hunting, trapping, eradicating), and other factors. Troughs result as transmission rates decrease among rabies die-off survivors, which tend to have a wider degree of geographic dispersion and perhaps some level of immunity. Survivors eventually reproduce, providing a new population of vulnerable animals through which the rabies virus can spread and which results in the next peak of the cycle. As the number of rabid reservoir animals (which are bats and skunks, in Missouri) increases, so does the chance of "spill-over" into other species, both wild and domestic. Presumably, the percentage of animals that test positive for rabies increases as the natural incidence increases (and vice versa), but there is little predictive value to this relationship since the exact correlation cannot be determined with existing data.

The SPHL is the only facility in Missouri that tests animals for rabies. Specimens are tested only when there is known exposure or "significant potential exposure" of any of the following to a possibly infected animal: humans, pets, domesticated animals (e.g., horses, livestock), exotic or non-native animal species maintained for husbandry purposes or in zoos. For more details regarding criteria for submission of rabies specimens (including the definition of "significant potential exposure"), refer to the rabies testing policy letter at http://health.mo.gov/lab/virology/pdf/rabies_testing_policy.pdf.

In 2009, specimens were submitted from all regions of the state, with rabid animals detected in 25 counties. The first rabid animal detected was a skunk in Ozark County on February 14, while the last animal was detected on December 4, again a skunk in Ozark County. The month with the highest number of cases (17) was August, with nine counties detecting a total of 3 skunks and 14 bats.



Section A - Communicable Disease Surveillance

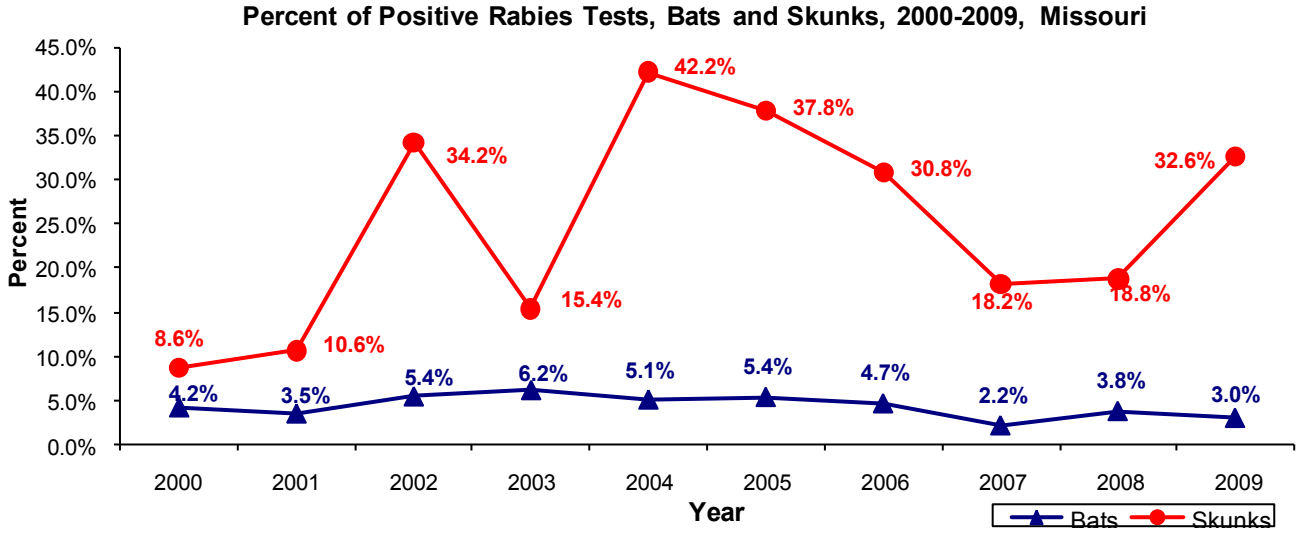
Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

Rabies in bats occurs sporadically throughout Missouri. It is estimated that less than 0.5 percent of the bats in the wild are rabid, and only 3 percent of the "high risk" bats (e.g., found sick, dead, or exhibiting unusual behavior) tested positive during 2009. The big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), and the tri-colored bat (*Perimyotis subflavus*) account for about 95 percent of the species of bats found to be rabid in Missouri. Note: The tri-colored bat was formerly known as the eastern pipistrelle bat. While rabid skunks can be found anywhere in the state, most cases are usually confined to roughly the southern one-half of Missouri. Both the north-central and south-central variants of the skunk rabies virus are found in rabid skunks in Missouri. The percent of skunks that test positive for rabies is much more variable than the percent of bats testing positive, with evidence of rabies infection found in 32.6 percent of the skunks submitted in 2009.

A county is placed under a "rabies alert" when a positive domestic animal is detected in that county, or when the threshold level for rabid wild animals is exceeded. One county (Dent) was placed under alert in June 2009 when a cat tested positive for rabies. Alerts routinely last for three months, but this alert was extended due to continued rabies activity in skunks. The alert was eventually lifted in December 2009.

Rabies (Human)

No human rabies deaths were recorded in Missouri in 2009. The last known human death from rabies in this state (2008) involved a man who was bitten by a bat and, although aware of the bite, did not seek medical care or report the incident to public health officials until he was symptomatic. A complete description of this case can be found in the *Morbidity and Mortality Weekly Report*, Centers for Disease Control and Prevention, Vol. 58/No. 43/November 6, 2009 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5843a3.htm).



Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

Rabies Postexposure Prophylaxis (Initiated)

"Rabies postexposure prophylaxis (initiated)" (PEP), became a reportable condition on August 31, 2006. This condition was reported only nine times during the remainder of that year, while 159, 259, and 232 reports were received in 2007, 2008, and 2009, respectively. CDC estimates that about 40,000 persons receive rabies PEP in the United States each year. Missourians no doubt account for a significant portion of these cases due to the endemnicity of rabies in wild animals in the state and the interaction of people and their pets with these animals. The expense of providing rabies PEP remains high, with an estimated average cost of $3,389 per patient.

Administration of rabies PEP is a medical urgency, not a medical emergency. Physicians should evaluate each possible exposure to rabies and, if necessary, consult with local or state public health officials regarding the need for rabies prophylaxis. Factors that should be considered before specific antirabies postexposure prophylaxis is initiated include type of exposure (bite, nonbite), epidemiology of rabies in animal species involved, circumstances of bite incident, vaccination status of exposing animal, and availability of animal for quarantine or testing.

If exposed to rabies, previously vaccinated persons should receive two intramuscular doses (1.0 ml each) of vaccine, one immediately and one three days later. Previously vaccinated persons are those who have received one of the recommended preexposure or postexposure regimens of cell tissue culture vaccine, or those who received another vaccine and had a documented rabies antibody titer. Human rabies immunoglobulin (RIG) is unnecessary and should not be administered to these persons because an anamnestic response will follow the administration of a booster regardless of the prebooster antibody titer.

Persons who have not been previously vaccinated should receive both vaccine and RIG. The combination of RIG and vaccine is recommended for both bite and nonbite exposures, regardless of the interval between exposure and initiation of treatment. A regimen of four 1-ml doses of vaccine should be administered intramuscularly. The first dose of the four-dose course should be administered as soon as possible after exposure (day 0). Additional doses should be administered on days 3, 7, and 14 after the first vaccination. Immunosuppressed individuals should receive a fifth dose of vaccine on day 28, with the awareness that the immune response may still be inadequate. A patient who fails to develop an antibody response should be managed in consultation with their physician and appropriate public health officials.

The following measures should be employed to help prevent rabies in the community:

- Ensure dogs, cats, and ferrets are vaccinated against rabies; vaccinations are also available for horses, cattle, and sheep.
- Keep pets under control; do not allow them to run loose.
- Avoid contact with stray pets and wild animals.
- Report stray pets to an animal control officer as well as wild animals that are acting strangely.

Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

- If bitten by an animal, wash the wound with soap and water for 10 to 15 minutes and consult a physician to determine if rabies PEP, tetanus booster, and antibiotics are needed.
- Have pets spayed or neutered, since pets that are fixed are less likely to stray from home and produce unwanted litters.
- Pets should not be handled without gloves or other protection directly after they have been exposed to wildlife since they might have saliva on their fur from a rabies-infected animal.

Additional Website Resources

CDC Health Topics

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Section A - Communicable Disease Surveillance

Shigellosis

Click to view maps

Shigellosis is an infectious disease caused by a group of bacteria called *Shigella.* Most people infected with Shigellosis develop diarrhea, fever, and stomach cramps starting a day or two after they are exposed to the organism. Stools are frequent, loose to watery, of small volume, and often mucoid and/or bloody. The diarrhea is usually self-limiting, resolving in 5 to 7 days. Young children and the elderly may be more severely affected, in some cases needing hospitalization. However, some individuals who are infected may have no symptoms at all, but could still pass the *Shigella* bacteria to others.

Table 1. Shigellosis, Compartative Statistics, by Socio-demographic Category, Missouri[1] 2009

		Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State of Missouri		1,046	100.00%	17.7	658	59.00%
Sex	Female	540	51.60%	17.9	366	47.50%
	Male	506	48.40%	17.5	292	73.30%
Race	Black	494	47.20%	70.3	82	502.40%
	Other	15	1.40%	11.1	2	650.00%
	Unknown	143	13.70%	N/A	182	-21.40%
	White	394	37.70%	7.8	220	79.10%
Age Group	00 to <01	25	2.40%	30.9	16	56.30%
	01 to 04	431	41.20%	135.3	219	96.80%
	05 to 14	364	34.80%	47.2	248	46.80%
	15 to 24	53	5.10%	6.5	36	47.20%
	25 to 39	104	9.90%	8.9	76	36.80%
	40 to 64	48	4.60%	2.5	52	-7.70%
	65 plus	17	1.60%	2.1	9	88.90%
	Unknown	4	0.40%	N/A	3	33.30%
District	Central	54	5.20%	8.3	13	315.40%
	Eastern	600	57.40%	26.8	123	387.80%
	Northwest	115	11.00%	7.5	55	109.10%
	Southeast	115	11.00%	24.9	18	538.90%
	Southwest	162	15.50%	15.9	50	224.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System (WebSurv)

Humans are the primary source of this infectious disease. Some other primates, such as certain species of monkeys or chimpanzees can carry or pass the organism. *Shigellosis* is transmitted by the fecal-oral route. When those who are infected fail to adequately wash their hands following a bowel movement, they subsequently transfer the organisms to food or objects that are ingested or placed in someone else's mouth. The infectious dose is quite small, from 10 to 200 organisms, compared to 10^6 (1,000,000) organisms for many strains of *Salmonella*. For this reason, it is extremely easy to spread shigellosis from person to person. Shigellosis can be a particular problem in group settings with people who may not have good bathroom hygiene, such as childcare centers.

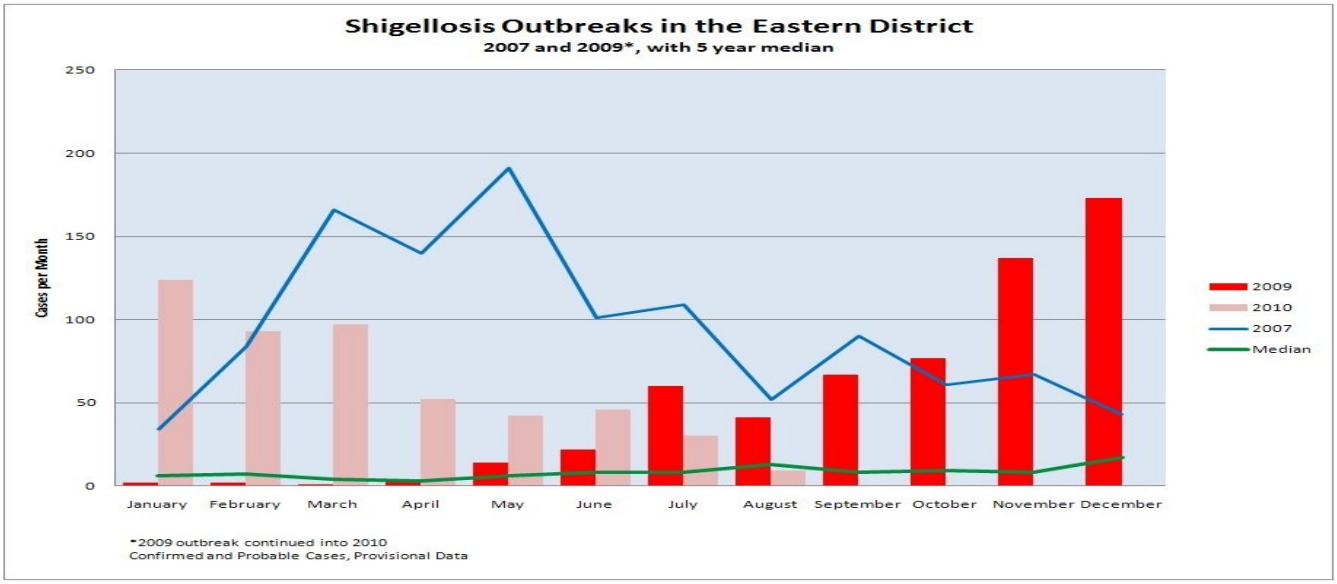
Statewide in 2009, Missouri recorded 1,046 confirmed and probable cases of shigellosis. This represents a statewide incidence rate of 17.7 per 100,000 population. This is more than double the median for the previous 10 years (507 cases) and nearly 60% above the five-year median, which included three years (2005, 2006 and 2007) during which major outbreaks pushed the yearly case count well above historic levels. Children ages 1 to 14 accounted for over 75% of the cases in 2009. In many instances, the older children were siblings of childcare cases.

Section A - Communicable Disease Surveillance

Shigellosis - Continued

Eastern District Outbreak: In 2009, nearly 60% of all reported shigellosis cases occurred in the Eastern District. As it did in 2007, the Eastern District experienced a major outbreak. Childcare centers provided the main reservoir for the cases, which then spread into the community at large, repeating a pattern established in the Northwestern District in 2005 and the Eastern District in 2007. Unlike the 2007 outbreak, cases were nearly all confined to St. Louis City and St. Louis County, with 1021 of 1075 (95%) cases occurring in those two jurisdictions over the entire course of the outbreak.

Figure 1: Shigellosis Outbreaks in the Eastern District, 2007 versus 2009



The 2009 outbreak actually lasted from May of 2009 through August of 2010. The highest percentage of cases (51%) were seen in children aged 4 and under. Nearly three quarters of the cases (73%) occurred in children less than 10 years old.

As can be seen in Table 2, the outbreaks were remarkably similar in the age groups affected. As was the case in 2007, the 2009 outbreak was predominantly in daycare associated children and their contacts.

Table 2: Comparison of the 2007 and 2009 shigellosis outbreaks in the Eastern Distsrict

Age Group	2007 outbreak Cases (% of Total)	2009 outbreak Cases (% of total)
0 to 4	606 (52.8%)	551 (51.3%)
5 to 9	242 (21.1%)	233 (21.7%)
10 to 14	68 (5.9%)	59 (5.5%)
15 and over	232 (20.2%	232 (21.6%)
Totals	1148 (100%)	1075 (100%)

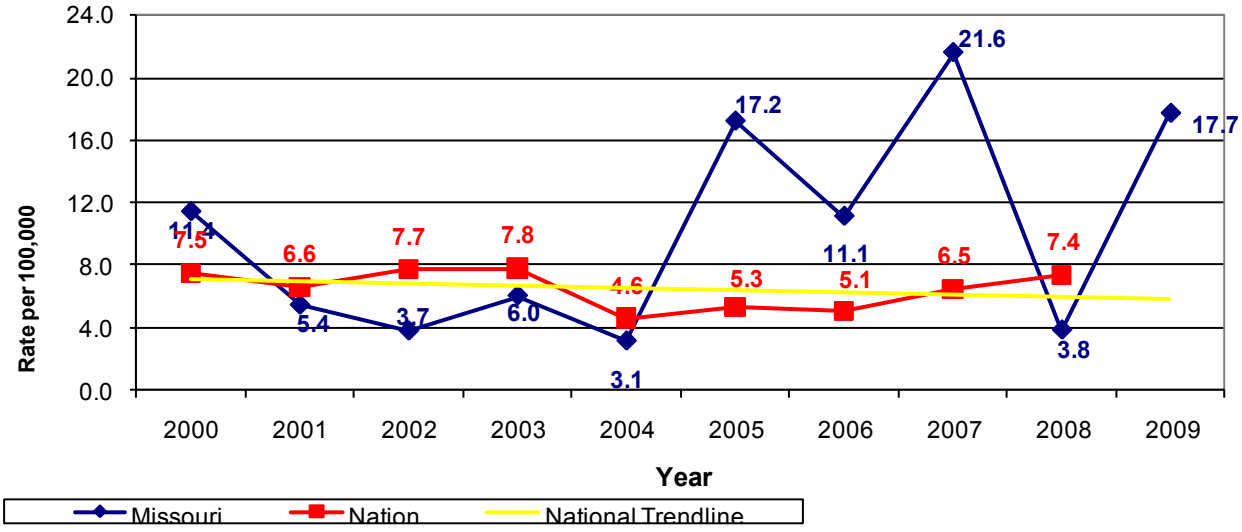
Section A - Communicable Disease Surveillance

Shigellosis - Continued

Comparison to National Trend: Missouri has been above the national rate for four of the past five years. Figure 2 illustrates periodic spikes in the rate of shigellosis in Missouri that are far above the national rate. In each instance, these spikes are the result of large outbreaks primarily associated with preschool age children. These outbreaks occurred in the Northwest District in 2005, the Southeast District in 2006, and the Eastern District in 2007 and 2009. Historically, Missouri occasionally climbs above the national rate for a few years, then drops back down to, or below, the national rate.

Several of these outbreaks have been exacerbated by the increase in antibiotic resistance, first noted during the 2005 outbreak in the Northwestern District. Since that time, much of the *Shigella* tested for antibiotic sensitivity has shown resistance to the most commonly used antibiotics. Although most people recover from shigellosis without the use of antibiotics, they are often prescribed for children who attend daycare to reduce the time those children shed the bacteria and thus, the time they must be excluded from attending daycare. Significant efforts have been made to alert physicians to the rise in antibiotic resistance and to encourage sensitivity testing so that an appropriate antibiotic may be chosen. Even with the use of appropriate antibiotics, strict adherence to good hygienic practices remains the most effective method for controlling the spread of shigellosis. A concerted educational effort involving parents, child care providers, and the private and public health communities, should be considered during any outbreak.

Figure 2. Rate of Reported Cases, Confirmed and Probable, Shigellosis, by Year
Missouri versus United States



Additional Website Resources

CDC Health Topics | CDIRM | Health Districts Defined

Section A - Communicable Disease Surveillance

Drug-resistant

<5 years

Streptococcus pneumoniae, drug resistant invasive disease and invasive in children less than five (5) years

Streptococcus pneumoniae (*S. pneumoniae*) also called pnuemococcus, are bacteria that are often found in the nose and throat of humans. Studies suggest *S. pneumoniae* can be found in 5% - 70% of healthy adults and up to 59% of healthy children. There are more than 90 serotypes that have been identified based on differences in the polysaccharide capsule produced by the pathogen. The distribution of the serotypes varies regionally and by the age of the infected persons.

Streptococcus pneumoniae are spread from person to person through respiratory droplets or direct contact with respiratory secretions. The majority of infected persons will not develop an illness though will be colonized with the bacteria and therefore are able to continue the spread of this opportunistic pathogen. Rates of infection are typically higher among infants, young children, and the elderly. Persons with immoncompromising or certain chronic conditions are also at a greater risk for *S. pneumoniae* associated disease. These conditions can include pneumonia, bacteremia, meningitis, peritonitis, and arthritis. In addition, *S. pneumoniae* is a common cause of ear infections particularly among children. The incubation period is not known though thought to be one to four days. Pneumococcal infections are most common in winter months and viral upper respiratory tract infections, including influenza, can predispose persons to *S. pneumoniae* associated disease.

Antibiotics are typically used to treat *S. pneumoniae* infections. Treatment decisions have become more complicated as the bacteria have developed resistance to certain antibiotics previously used for treatment. Until the mid-1970's, most relevant antibiotics readily treated *S. pneumoniae* infections. In some areas of the United States, up to 40% of invasive *S. pneumoniae* isolates are resistant to penicillin. Because resistance is common, susceptibility testing of *S. pneumoniae* isolates is often used to determine the appropriate antibiotic therapy.

Pneumococcal vaccines play an important role in preventing invasive *S. pneumoniae* infections. Currently, there are two pneumococcoccal vaccines available in the United States. The 23-valent polysaccharide vaccine (PPSV23) is recommended for all adults 65 years of age and older, and for persons two years of age and older with certain preexisting medical conditions. The pneumococcal conjugate vaccine (PCV13) is recommended for all children younger than 24 months of age and children 24-59 months of age with a high risk medical condition. Since the introduction of the pneumococcal conjugate vaccines in 2000 through 2006, the incidence of vaccine-type invasive pneumococcal infections decreased by 99% and the incidence of invasive *S. pneumoniae* decreased by 77% in children younger than five years of age in the United States.

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued

Surveillance for *S. pneumoniae* associated diseases can vary among states nationally. The infections are determined to be invasive when the bacteria are identified in a normally sterile site including blood, cerebrospinal fluid, or less commonly joint, pleural, or pericardial fluid. In Missouri, two categories of invasive *S. pneumoniae* infections are reportable: 1) invasive diseases in children less than five years of age; and 2) invasive disease in all ages where the *S. pneumoniae* is determined to be resistant to at least one antimicrobial agent approved for use in treating the infection. A summary of *S. pneumoniae* invasive disease based on each of the two reporting categories is provided below.

Table 1. Strep Pneumoniae, Invasive in children less than five (5) years, Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State of Missouri		41	100.00%	0.7	18	127.80%
Sex	Female	20	48.80%	0.7	9	122.20%
	Male	21	51.20%	0.7	12	75.00%
Race	Black	13	31.70%	1.8	5	160.00%
	Other	1	2.40%	0.7	0	N/A
	Unknown	7	17.10%	N/A	4	75.00%
	White	20	48.80%	0.4	13	53.80%
Age Group	00 to <01	15	36.60%	18.5	7	114.30%
	01 to 04	26	63.40%	8.2	9	188.90%
	05 to 14	0	0.00%	0	0	0.00%
	15 to 24	0	0.00%	0	0	0.00%
	25 to 39	0	0.00%	0	0	0.00%
	40 to 64	0	0.00%	0	0	0.00%
	65 plus	0	0.00%	0	0	0.00%
District	Central	2	4.90%	0.3	4	-50.00%
	Eastern	17	41.50%	0.8	6	183.30%
	Northwest	13	31.70%	0.8	8	62.50%
	Southeast	4	9.80%	0.9	1	300.00%
	Southwest	5	12.20%	0.5	1	400.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Streptococcus pneumoniae Invasive Disease in Children Less than Five Years of Age

In 2009, a total of 41 cases of invasive *S. pneumoniae* infections were reported among children less than five years of age in Missouri. The resulting state rate was 0.7 cases per 100,000 population and represents a 128% increase from the previous five-year median. However, the exact same number of cases was reported among Missouri residents in 2008. No difference in the gender specific incidence rates for invasive disease was observed in 2009. Approximately 50% of cases occurred among white children however, the race specific incidence rate was 4.5 times greater among black children compared to white children. Similarly, the majority of reported cases (26 cases) consisted of children aged 1 to 4 years, though the age specific incidence rates were 2.3 times greater among infants. Invasive *S. pneumoniae* infections were reported from each region of the state in 2009. Increases in the reported cases were observed in each region with the greatest increases observed in the Southwest, Southeast, and Eastern districts of the state.

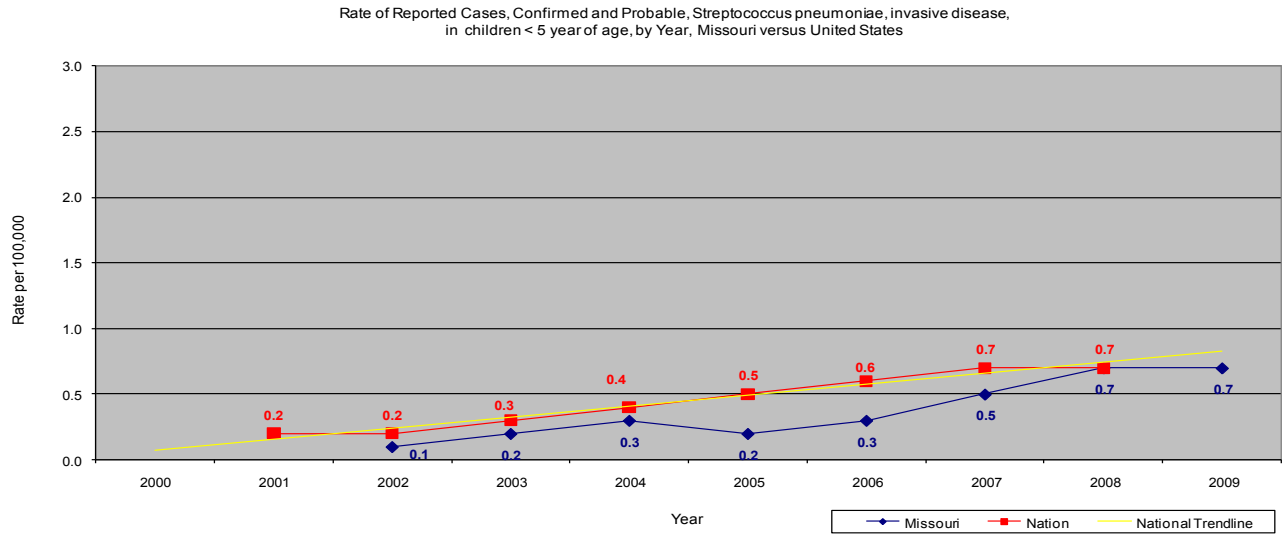
Comparison to National Data: The observed incidence of reported *S. pneumoniae* invasive diseases cases reported among children less than five in Missouri has gradually increased during the past seven years with the exception of 2005. The upward trend observed in Missouri is consistent with the overall trend observed nationally. During this time the incidence rate in Missouri, though increasing, has remained consistently below the reported rates nationally. However, during 2009 the overall incidence rate in Missouri mirrored

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued

the national rate of 0.7 cases per 100,000 population. It is unclear if the observed increase in the incidence rate in Missouri over the past four years is the result of an actual increase in incidence of the disease or the result of improved reporting of the condition. No outbreaks of invasive *S. pneumoniae* were reported among Missouri children less than five years of age in 2009.

Streptococcus pneumoniae remains one of the two most common causes of bacterial meningitis in infants and young children in the United States. The introduction of the PCV7 vaccine has greatly reduced the incidence of *S. pneumoniae* infections; however, invasive disease caused by serotypes of the bacteria not included in the vaccine has increased nationally. In addition, treatment of invasive disease can be challenging given the propensity of the organism to develop resistance to antibiotics traditionally prescribed for treatment. *Streptococcus pneumoniae* is easily spread particularly among children. Continued surveillance for this opportunistic pathogen is important as BCDCP continues to evaluate the effectiveness of the pneumococcal vaccines, and monitors for changing trends of invasive disease among those most vulnerable, which includes the very young.



Streptococcus pneumoniae Drug Resistant Invasive Disease

In 2009, a total of 74 cases of invasive *S. pneumoniae* infections reported among Missouri residents were caused by isolates resistant to an antibiotic approved for use in treatment and determined to be drug resistant. The resulting state rate was 1.3 cases per 100,000 population, which is a slight decrease from the state rate of 1.6 cases per 100,000 population in 2008. Sixty percent of cases were among females with gender specific rates 1.5 times greater than for males. Similarly, race specific rates were higher among

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued

blacks than whites, 1.6 and 1.0 per 100,000 population respectively. Missouri residents 65 years of age and older are at greatest risk for drug resistant *S. pneumoniae* invasive disease with age specific rates approximately two times greater than the next highest age group, persons aged one to four year. Reported cases increased in each district of the state with the exception of the Central district. The highest rates (3.5 cases per 100,000 population) were reported among residents of the Southeast district, which is 2.7 times greater than the overall state rate.

Table 2. Strep Pneumoniae, Drug-ResistantComparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State of Missouri		74	100.00%	1.3	44	68.20%
Sex	Female		59.50%	1.5	23	91.30%
	Male	29	39.20%	1	21	38.10%
	Unknown	1	1.40%	N/A	0	N/A
Race	Black	11	14.90%	1.6	4	175.00%
	Other	1	1.40%	0.7	0	N/A
	Unknown	10	13.50%	N/A	9	11.10%
	White	52	70.30%	1	33	57.60%
Age Group	00 to <01	1	1.40%	1.2	1	0.00%
	01 to 04	5	6.80%	1.6	1	400.00%
	05 to 14	3	4.10%	0.4	2	50.00%
	15 to 24	8	10.80%	1	0	N/A
	25 to 39	6	8.10%	0.5	4	50.00%
	40 to 64	26	35.10%	1.3	18	44.40%
	65 plus	25	33.80%	3.1	17	47.10%
District	Central	7	9.50%	1.1	8	-12.50%
	Eastern	32	43.20%	1.4	17	88.20%
	Northwest	13	17.60%	0.8	9	44.40%
	Southeast	16	21.60%	3.5	10	60.00%
	Southwest	6	8.10%	0.6	4	50.00%

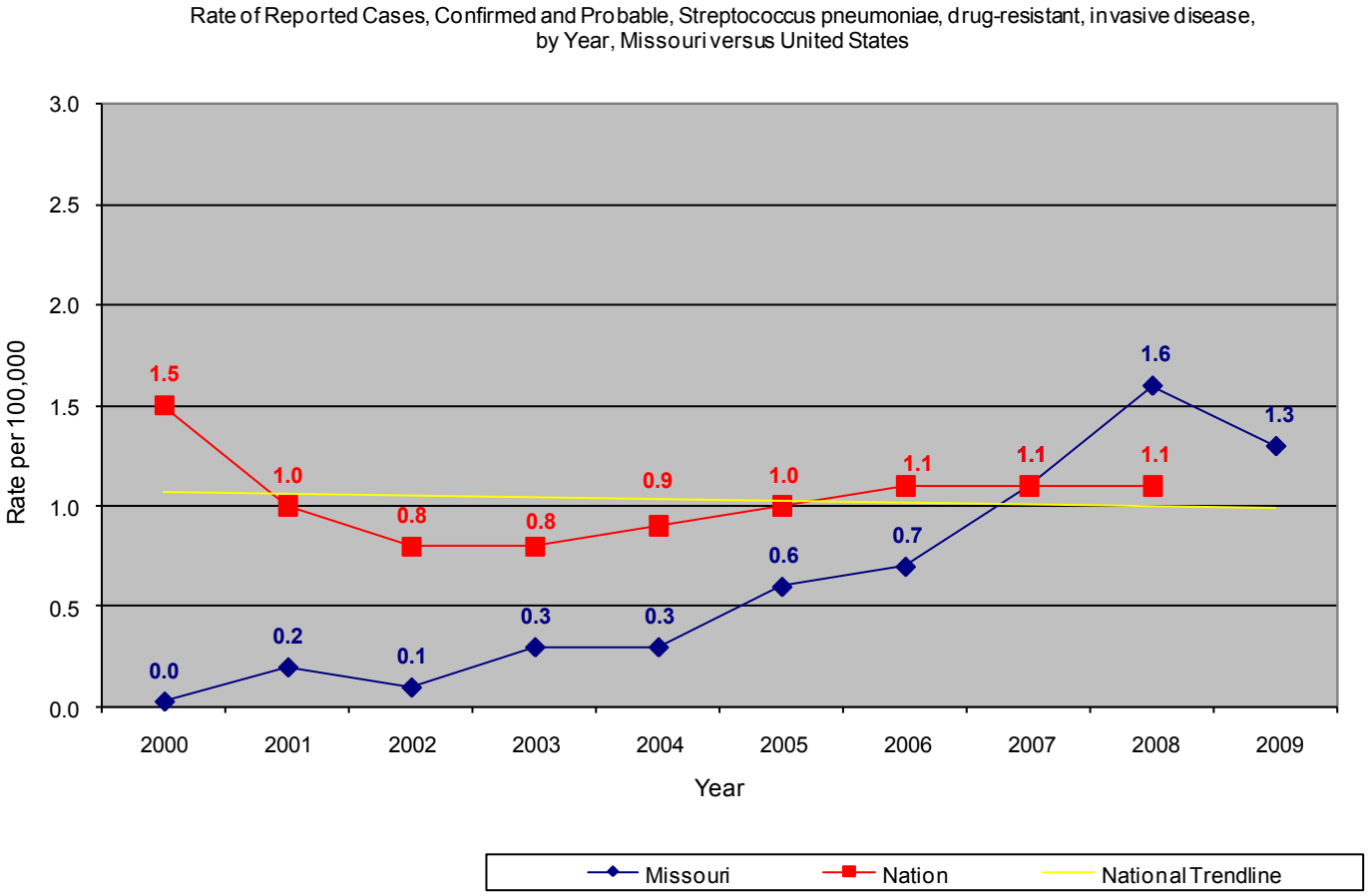
[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Comparison to National Data: The overall rates of drug resistant invasive *S. pneumoniae* infections nationally have remained relatively static during the previous ten years. Prior to 2008, the rates in Missouri were typically below the rates nationally. The decrease in cases observed in Missouri in 2009 result in rates relatively consistent with rates nationally. The fluctuation in rates of the disease in Missouri is not fully understood. No outbreaks of invasive drug resistant invasive *S. pneumoniae* infections were reported among Missouri residents in 2009.

The development of drug resistant pathogens is an important issue as many of the antibiotics previously used to treat these infections are no longer effective. *Streptococcus pneumoniae* can become resistant to antibiotics by acquiring genetic material from other bacteria with which they coexist in close proximity. This highlights the importance of appropriate use of antibiotics. The surveillance of drug resistance invasive *S. pneumoniae* infections is critical in the continued efforts to monitor for increased drug resistance and evaluate the effectiveness of the pneumococcal vaccines. Currently, despite the availability of pneumococcal vaccines for disease prevention and antibiotics used to treat disease, approximately 14% of hospitalized adults with invasive disease caused by *S. pneumoniae* will die due to the illness.

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued



Additional Website Resources

CDC Health Topics

CDIRM

Health Districts Defined

Section A - Communicable Disease Surveillance

Tuberculosis and LTBI

TB Map

LTBI Map

Tuberculosis (TB) is a disease caused by the bacterium called *Mycobacterium tuberculosis*. The bacteria can attack any part of your body, but it usually attacks the lungs. TB is spread through the air from one person to another. The bacteria are expelled into the air when a person with TB disease of the lungs or throat coughs, sneezes, speaks or sings. These bacteria can stay in the air for several hours, depending on the environment.

Table1. Tuberculosis, Comparative Statistics, by Socio-demographic Category, Missouri[1] 2009

		Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State of Missouri		80	100.00%	1.4	108	25.90%
Sex	Female	37	46.30%	1.2	46	-19.60%
	Male	43	53.80%	1.5	63	-31.70%
Race	Black	24	30.00%	3.4	36	-33.30%
	Other	25	31.30%	18.6	20	25.00%
	White	31	38.80%	0.6	55	-43.60%
Age Group	00 to <01	1	1.30%	1.2	0	N/A
	01 to 04	4	5.00%	1.3	2	100.00%
	05 to 14	1	1.30%	0.1	1	0.00%
	15 to 24	10	12.50%	1.2	14	-28.60%
	25 to 39	23	28.80%	2	24	-4.20%
	40 to 64	26	32.50%	1.3	40	-35.00%
	65 plus	15	18.80%	1.9	27	-44.40%
District	Central	6	7.50%	0.9	8	-25.00%
	Eastern	37	46.30%	1.7	46	-19.60%
	Northwest	23	28.80%	1.5	33	-30.30%
	Southeast	4	5.00%	0.9	8	-50.00%
	Southwest	10	12.50%	1	17	-41.20%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

People who become infected with TB bacteria usually have had very close, day-to-day contact with someone who has TB disease (e.g. a family member, friend, or close co-worker). You are not likely to get infected from someone coughing in line at a supermarket or restaurant. Dishes do not spread TB, nor do drinking glasses, sheets, or clothing. In most people who become infected, the body is able to fight the bacteria to stop them from growing. The bacteria become inactive, but they remain alive in the body and can become active later. This is called latent TB infection (LTBI). These people do not have symptoms of TB disease, and they cannot spread TB to others.

Statewide in 2009, Missouri recorded 80 cases of TB disease. This represents a statewide incidence rate of 1.4 per 100,000, reflecting a decrease in cases from 107 cases in 2008. Persons over 40 years of age represent 51% of the TB cases in Missouri.

The rate of individuals born outside of the United States who were diagnosed with TB while residing in Missouri continues to comprise a significant portion of the TB cases in Missouri. In 2009, 57% of all TB cases were in individuals who were born outside of the United States. This represents no change in the percentage from 2008; it is an increase of 21% from the 36% reported in 2007.

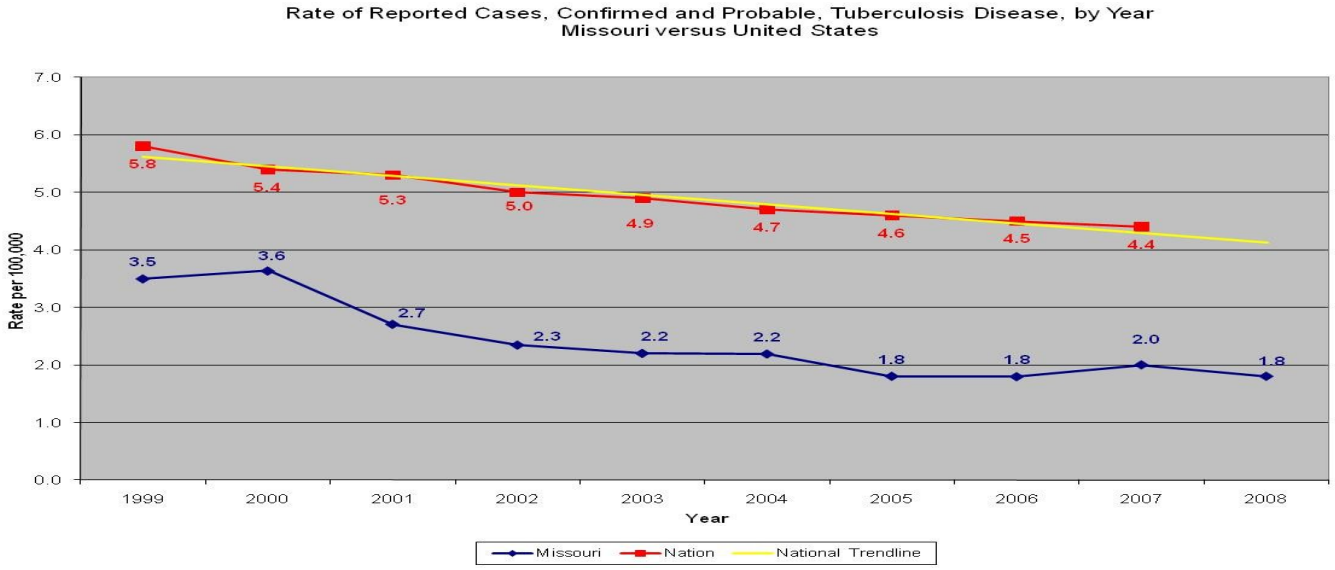
Section A - Communicable Disease Surveillance

Tuberculosis and LTBI - Continued

In 2009, Missouri had two cases that required an extended TB contact investigation. One case of tuberculosis was identified in a health care worker at a major medical facility in the state. As a result, 335 individuals were identified as contacts to this case. These contacts included staff members and patients, including children, from four different facilities. Among these contacts, eleven individuals were diagnosed with LTBI. The second case was a student at a college in Missouri. The investigation identified 180 staff and students contacts associated with this case. Of the identified contacts, eight individuals were diagnosed with LTBI.

If you are infectious with TB , there are certain things you can do to protect yourself and others near you. Your doctor will likely tell you to follow these guidelines to protect yourself and others:

- The most important thing is to take your medicine.
- Always cover your mouth with a tissue when you cough, sneeze, or laugh. Put the tissue in a closed bag and throw it away.
- Do not go to work or school until approved to do so by public health officials. Separate yourself from others and avoid close contact with anyone. Sleep in a bedroom away from other family members.
- Air out your room. as often as possible, to the outside of the building (weather permitting). TB spreads in small, closed spaces where air does not move. Put a fan in your window to blow out (exhaust) air that may be filled with TB bacteria. If you open other windows in the room, the fan also will pull in fresh air. This will reduce the chances that TB bacteria will stay in the room and infect someone who breathes the air.



Section A - Communicable Disease Surveillance

Tuberculosis and LTBI - Continued

Remember, TB is spread through the air. People cannot get infected with TB bacteria through handshakes, sitting on toilet seats, or sharing dishes and utensils with someone who has TB.

After taking medication, as directed, for two to three weeks, you may no longer be able to spread TB bacteria to others. If your doctor and public health agrees, you will be able to go back to your daily routine. Remember, you will get well only if you take your medicine exactly as directed.

Think about people who may have spent time with you, such as family members, close friends, and co-workers. The local health department may need to test them for LTBI. TB is especially dangerous for children and people with HIV infection. If infected with TB bacteria, these people need medicine right away to keep from developing active TB disease.

LTBI

Suspected and/or confirmed TB disease is a reportable condition in Missouri. Missouri is one of a few states that also require the reporting of LTBI. If an individual has a normal chest x-ray and a positive TST (tuberculin skin test) they are considered infected with TB and could benefit from treatment. Persons at greatest risk for exposure to TB would be: close contacts of a person with known/suspected TB, foreign born from areas where TB is common, resident or employee of high-risk congregate settings such as jails, prisons, homeless shelters and nursing homes, and health care workers. Persons at higher risk for developing disease once infected include: HIV-positive persons, medically underserved and persons with certain medical conditions.

Table 2. LTBI Comparative Statistics by Health Districts, Missouri[1], 2009

	Case Count 2009	% of Total	Rate* 2009	5-Year Median	% Change from 5-Year Median
State Of Missorui	3,393	100.00%	57.4	3,837	-11.60%
Central	400	11.80%	61.6	446	-10.30%
Eastern	1,279	37.70%	57.1	1,355	-5.60%
Northwest	672	19.80%	43.6	1,036	-35.10%
Southeast	99	2.90%	21.4	160	-38.10%
Southwest	718	21.20%	70.6	423	69.70%
Institutionalized	225	6.60%	736.2	293	-23.20%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2008 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Missouri had 3,393 reported cases of LTBI in 2009. Approximately 10% of these individuals could develop TB in their lifetime if not treated for LTBI.

Additional Website Resources

CDC Health Topics | CDIRM | Health Districts Defined

Glossary

Agent (of Disease) - A factor (e.g. virus, bacterium , parasite, chemical, or radiation) whose presence, excessive presence, or absence of, is essential for the occurrence of disease.

Bioterrorism - The intentional use of chemical, biological, or radiological agents as weapons during acts of violence or intimidation.

Case - A person or animal identified as having a particular disease.

Confirmed Case - surveillance definition, a case usually with positive laboratory results for the disease, generally associated with signs and symptoms of the disease.

Probable Case - surveillance definition, a case usually with a clinically compatible illness that is epidemiologically linked to a confirmed case.

CD - Communicable Disease (or Infectious Disease) - diseases caused by biological agents such as a virus, bacterium or parasite.

Communicable - Able to spread disease from one person or species to another, either directly or indirectly; contagious.

Disseminated intravascular coagulopathy - bleeding into the skin.

ELC - Epi Laboratory Capacity Grant.

Endemnicity - Amount or severity of a disease in a particular geographic area.

Epidemiology - The study of how and why diseases and other conditions are distributed within the population the way they are.

Epidemiologist - An investigator who studies the occurrence of disease or other health-related conditions or events in defined populations.

Fecal-oral - The transmission of an infectious agent by ingestion of feces.

Five-year Median - A data set which includes five consecutive year data totals where half of the elements have a larger value and half of the elements have a lesser value. The median can be thought of as the "middle" of the data.

Glossary

Incidence - The number of new cases of a disease occurring in a population during a defined time period.

Incidence Rate - The rate at which new events occur in a population. For examples of the calculations, see page 59.

Incubation period - The time between exposure to an infectious agent and appearance of the first sign or symptom of the disease.

Leukopenia - Abnormal decrease of white blood cells usually below 5000/mm^3.

Malaise - A subjective sense of discomfort, weakness, fatigue, or feeling rundown that may occur alone or accompany other symptoms and illnesses.

Mean - Commonly called average, is defined as the sum of the observations divided by the number of observations. For examples of the calculations, see page 59.

Median - The point in a data set where half of the elements have a larger value and half of the elements have a lesser value. The median can be thought of as the "middle" of the data. For examples of the calculations, see page 49.

Morbidity - Having disease, or the proportion of persons in a community with the disease.

Mortality - Refers to death.

Myalgia - Tenderness or pain in the muscles; muscular rheumatism.

Neonate - a newborn infant up to one month of age.

Outbreak - The occurrence of illness(es) similar in nature and clearly in excess of normal expectancy.

Pandemic - An outbreak occurring over a wide geographic area; widespread.

Pathogen - An organism capable of causing disease.

Pathogenic - Capable of causing disease.

PCR - Polymerase Chain Reaction. A laboratory procedure used to identify pathogens through amplification of genetic material.

PFGE - Pulse Field Gel Electrophoresis. A laboratory procedure of bacterial strain typing.

Polysaccharide capsule - A protective covering made out of sugar molecules that surrounds some bacteria.

Glossary

Prevalence - The total number of cases of a disease existing in a given area at any given time.

Preventable TB case:
- A person with a previous positive TB skin test who is a candidate for treatment and not offered treatment;
- A person with a risk factor for TB who is never offered a TB skin test; and/or
- A secondary case to a preventable case.

Quartile - Any of three values which divide the sorted data set into four equal parts, so that each part represents 1/4 of the sample or population.

Recreational Water - Swimming pools, hot tubs, water parks, water play areas, interactive fountains, lakes, rivers, creeks or oceans.

Risk Factors - The presence of any particular factor known to be associated with health related conditions considered important to prevent.

Sequela - A condition following and resulting from a disease.

Serotype - To distinguish organisms on the basis of their constituent antigen(s).

Surveillance (of disease) - An ongoing mechanism to collect, analyze, interpret and distribute information.

Trend - Shows movement consistently in the same direction over a long time.

Thrombocytopenia - An abnormal decrease in the number of platelets.

Vaccine - A suspension of attenuated live or killed microorganisms or fractions thereof, administered to induce immunity and thereby prevent infectious disease.

Vector - A carrier, usually an insect or other arthropod.

Statistical Calculations

Examples of Central Tendency Calculation

Mean

Calculate the **mean** by adding all of the values and dividing the sum by the number of observed values (in this case 11).

55 + 12 + 60 + 46 + 85 + 27 + 39 + 94 + 73 + 5 + 60 = **556**

556 / 11 = **50.54545455**

The **mean** for this data set is **50.5** (result is rounded).

Median

The **median** is the element that falls in the middle of the ordered set. Rank the values from least to most:

39, 60, 73, 85, 55, 27, 12, 94, 60, 46, 5

In this example the **median** is the sixth element in the set, which is **55**.

5, 12, 27, 39, 46, **55**, 60, 60, 73, 85, 94

Example of a Measure of Frequency Calculation

Incidence rates are calculated with the following equation:

(X divided by Y) multiplied by K

Where:
X is the number of cases for a specified time period
Y is the population (possibly exposed) for the same time period
K is a constant (often 1000 or 100,000) that transforms the result into a uniform quantity allowing comparison with other similar quantities.

Example: The Southwest Region has 86 cases of Hepatitis A in 1993, compared to 63 cases in the Central Region for that year. The 1993 population for the Southwest Region is 694,712, while the population for the Central Region is 621,740.

Southwest Region: **(86 / 694,712) * 100,000 = 12.4**
Central Region: **(63 / 621,740) * 100,000 = 10.1**

A comparison of the two incidence rates shows that in 1993 Southwest Region has a slightly higher incidence of Hepatitis A (12.4 reported cases per 100,000 population) than the Central Region (10.1 reported cases per 100,000 population).